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ICE AND FROST

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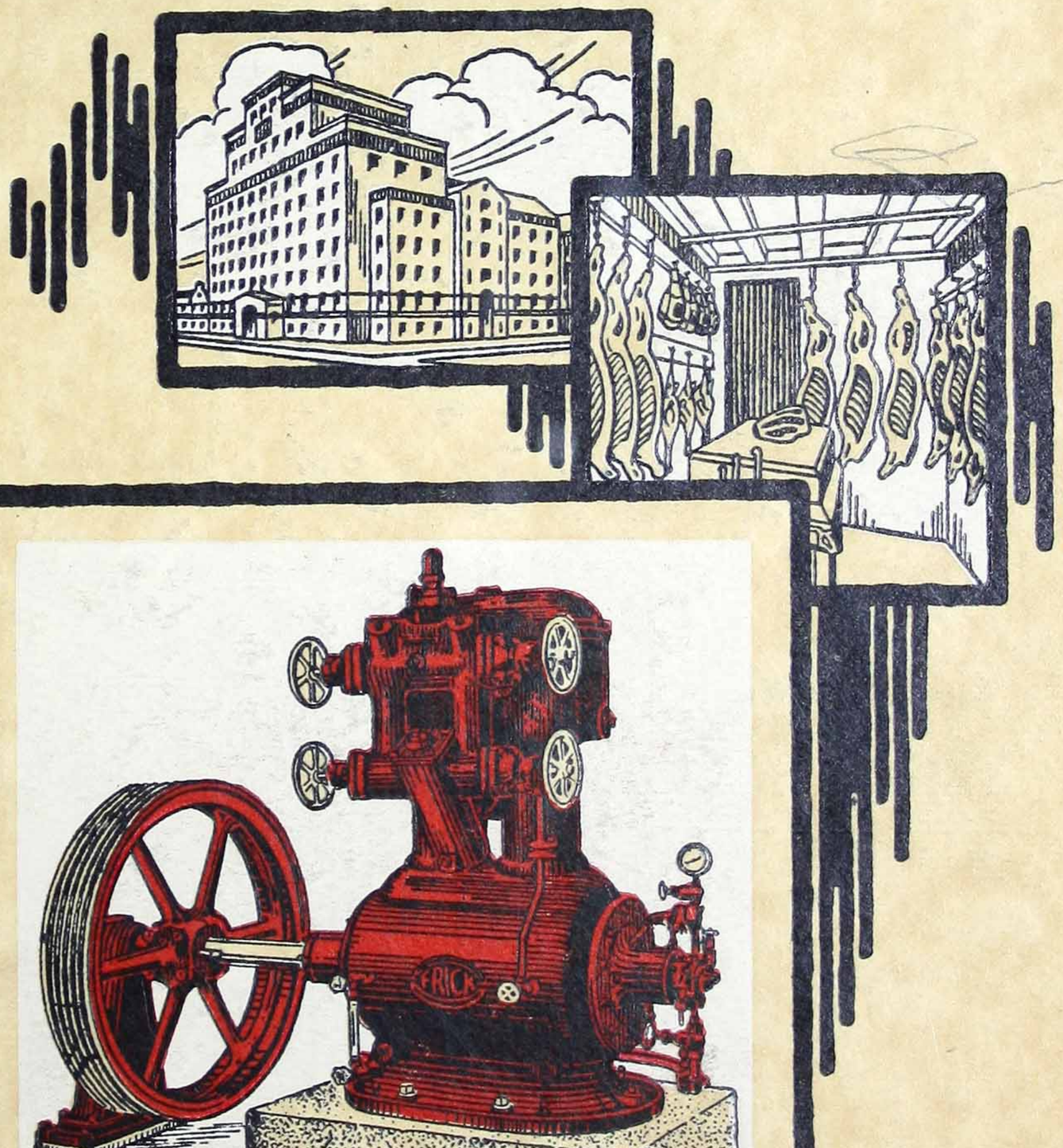
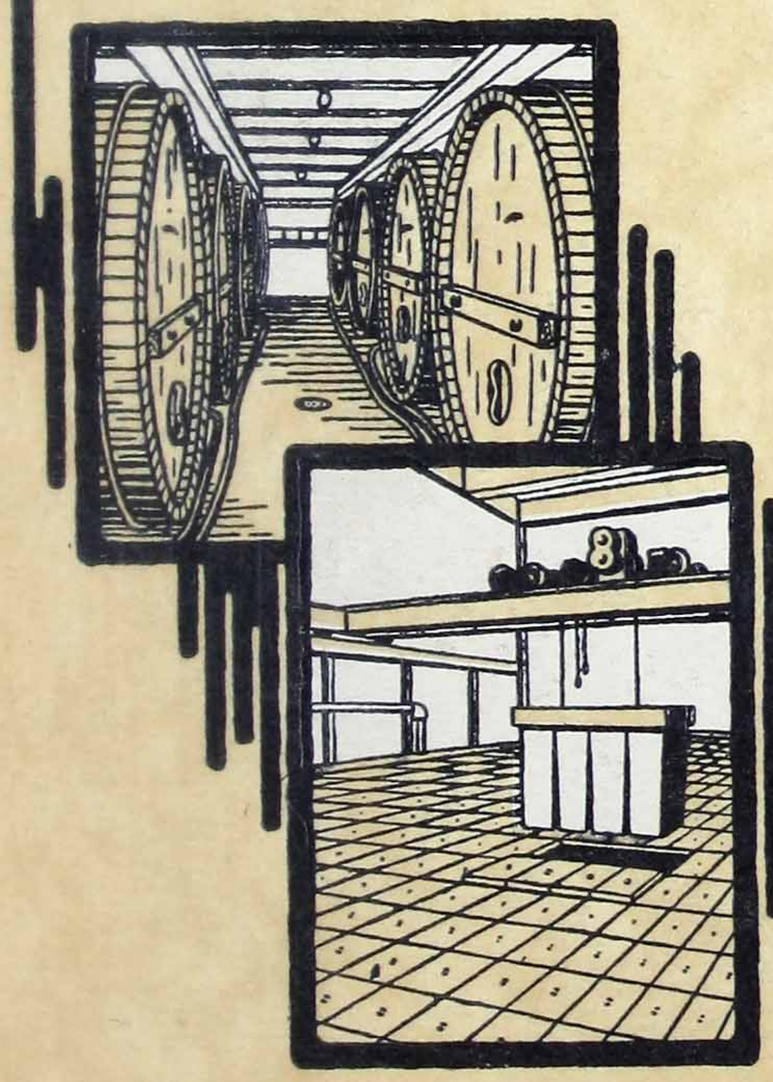
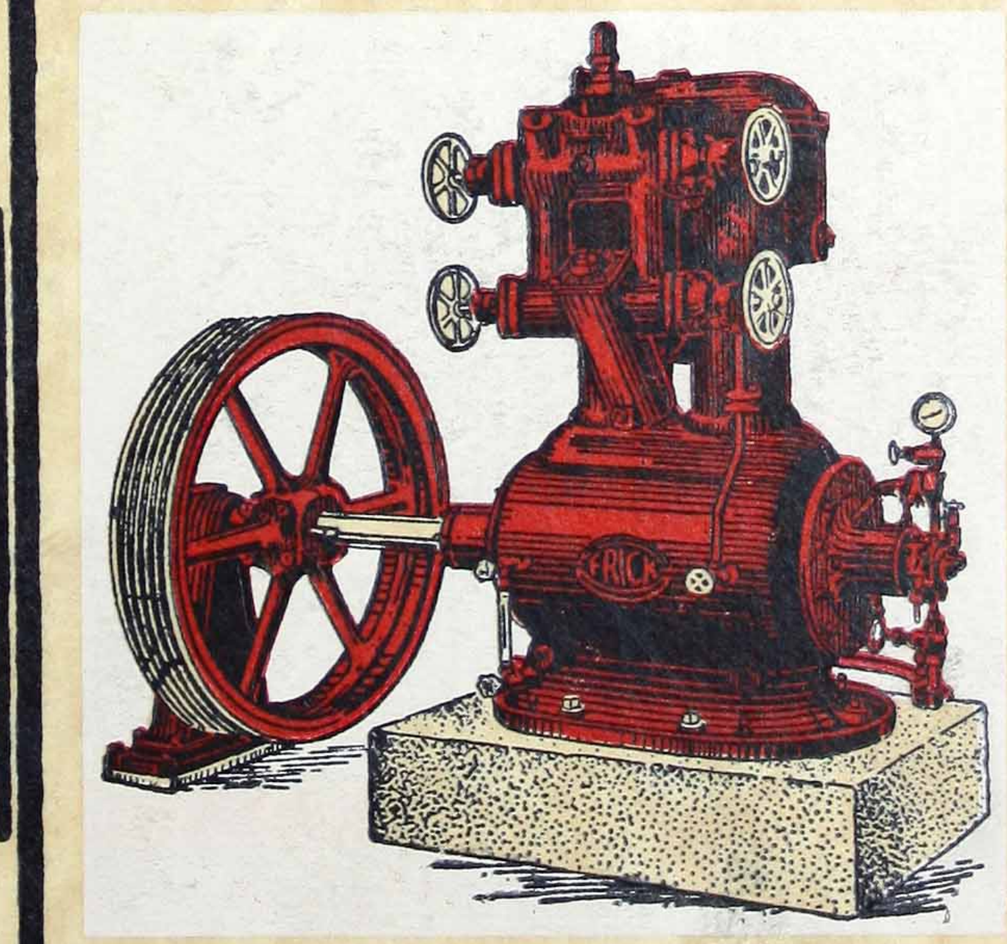
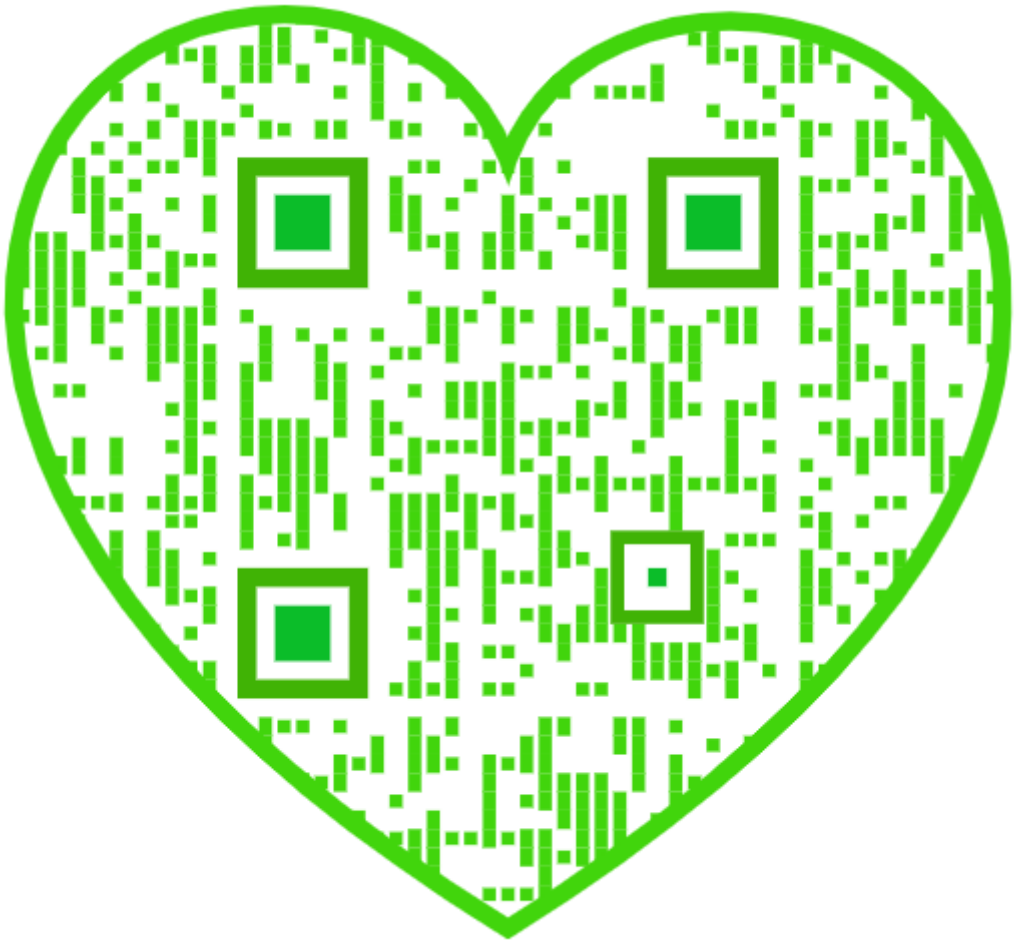






Bulletin
No. 112-G

Frick Enclosed-type
Ammonia Compressors



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API INTERNATIONAL

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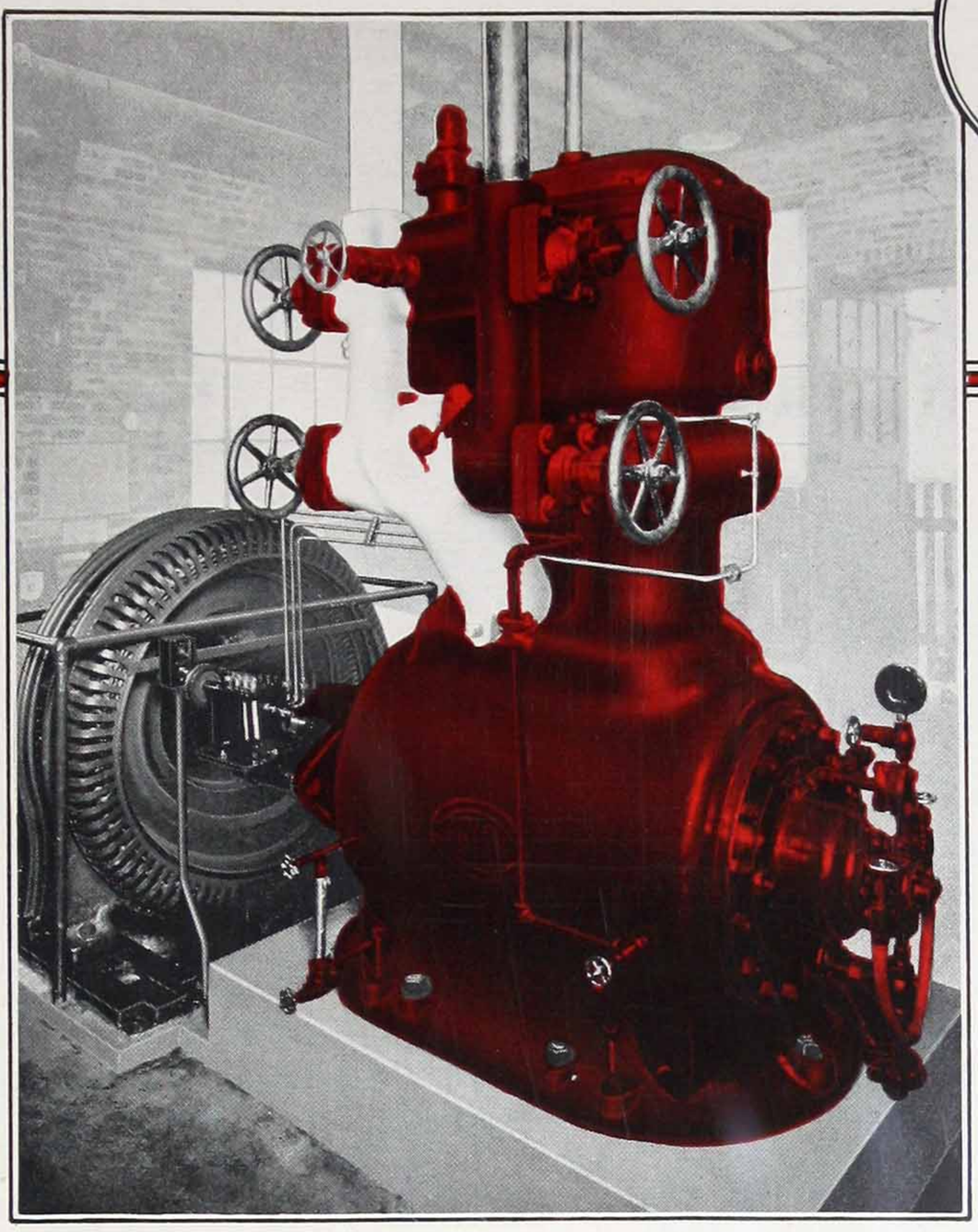
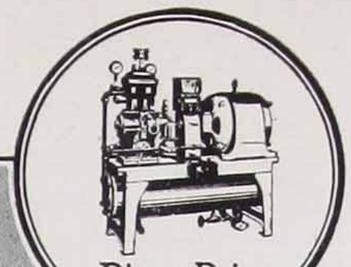


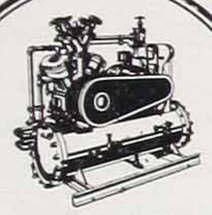
Belt-Drive Unit



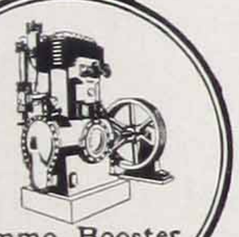
Direct-Drive Unit

Large Freon-12 Unit

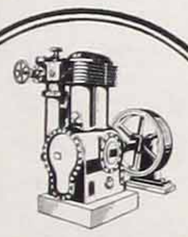
Low Pressure Units



Type AV Unit



Ammo. Booster Machine



Freon-12 Compressor

Large 4-Cyl. Compressor

Frick Enclosed-type Ammonia Compressors

- General Features -

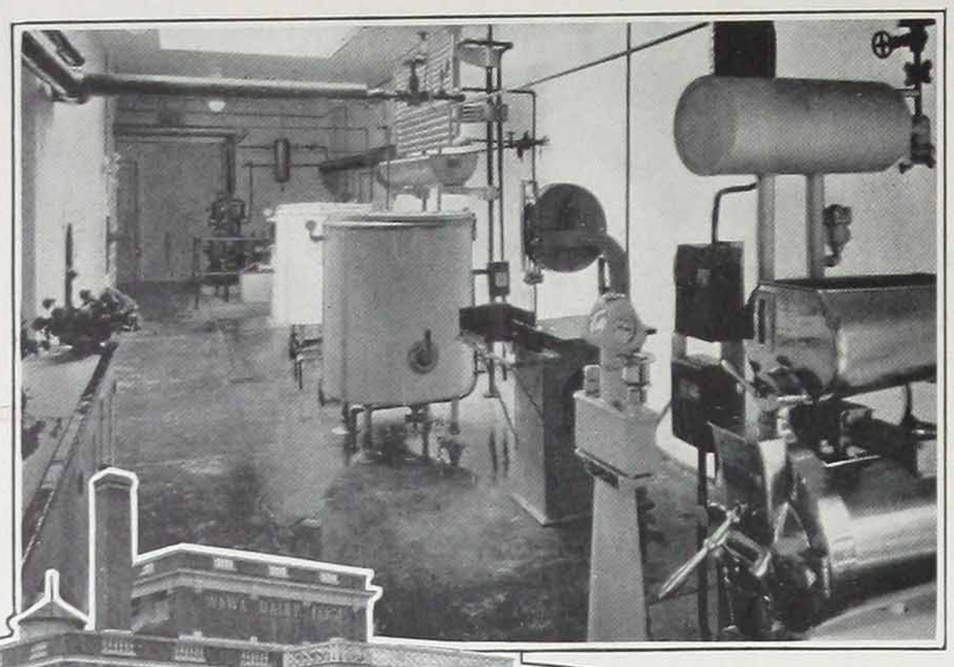
The inherent advantages of the enclosed design have resulted in its adoption, with slight variations, for Frick compressors of all the latest types and sizes.

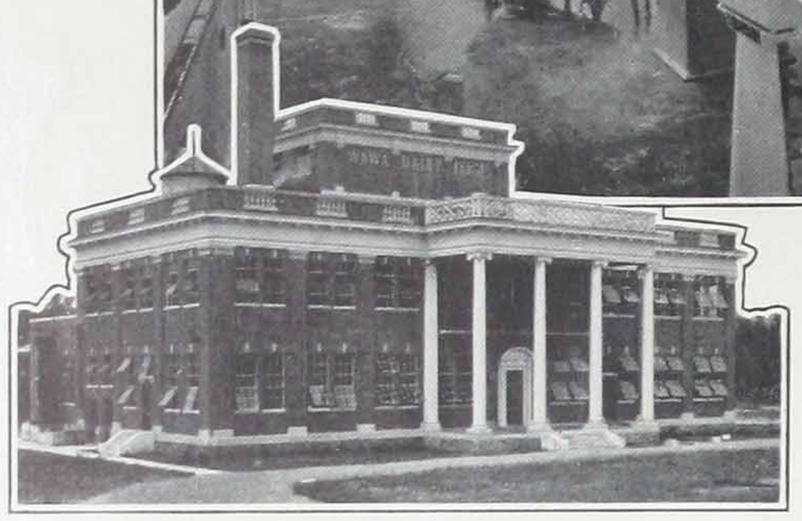
These advantages include balanced vertical operation, adaptability to any kind of drive and to automatic control, one-way gas travel, efficient compression, greater safety, quietness and ease of operation, continuous automatic lubrication, standardized precision manufacture, renewable wearing parts, small floor space and headroom required, prompt installation, long useful life, etc.

Frick enclosed-type compressors for use with ammonia are built with cylinders in sizes from 1½ in. by 1½ in. to 17¾ in. by 12 in. Machines of the sizes described in this bulletin are equipped with force-feed oiling systems, ring plate discharge valves, outboard bearings beyond the flywheels, cylinders and crankcase cast in one piece (except on four-cylinder machines), capacity controls or dual-pressure operation when desired, oversize bearings and other features which adapt them to the heaviest industrial service. Machines with cylinders measuring 5 in. by 5 in., 6 in. by 6 in. and 7 in. by 7 in. are furnished with base frames extending under the outboard bearings, as standard.

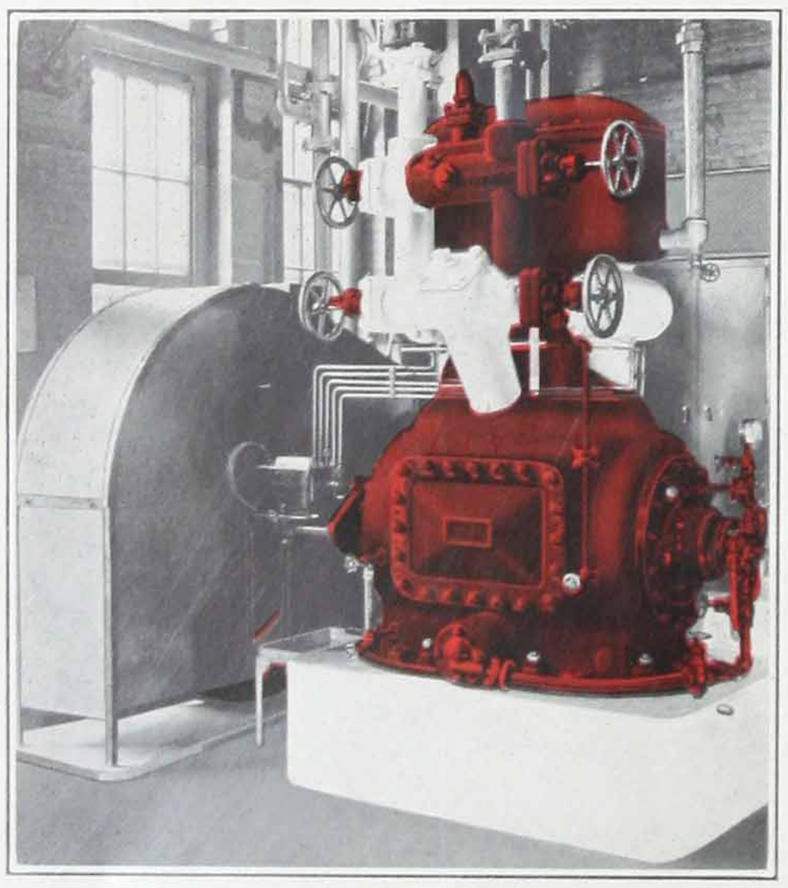
Tens of thousands of these Frick machines are operating in commercial and industrial plants of all kinds. In the following pages a brief review is presented, showing their uses in leading fields.

ICE AND FROST



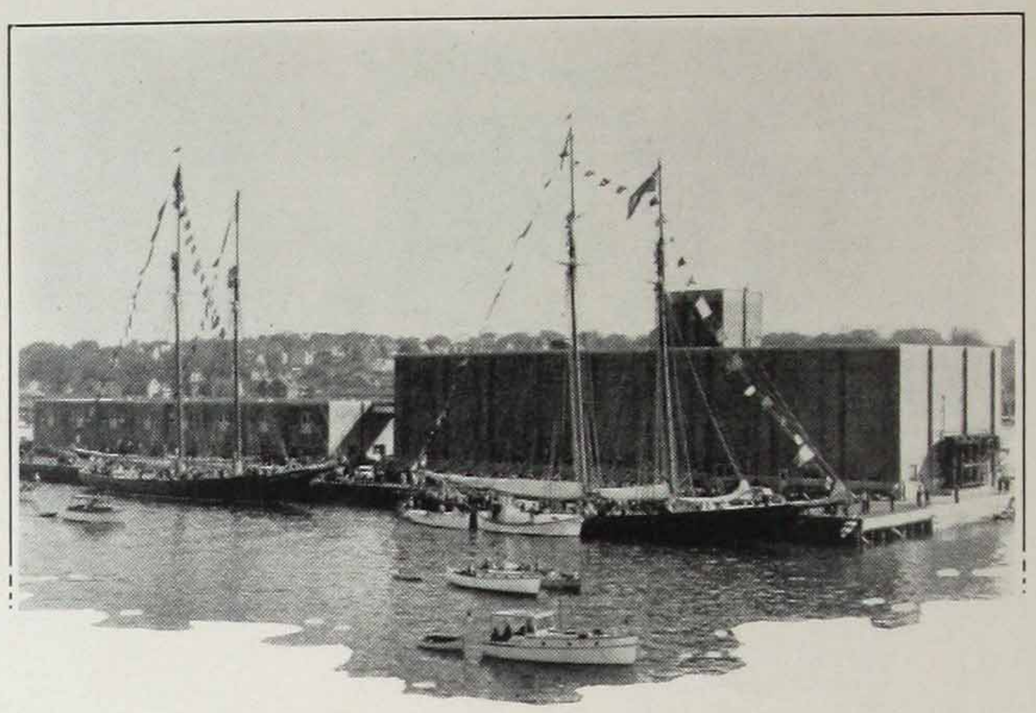


Dairies and Ice Cream Plants Find Enclosed Compressors Efficient and Reliable



One of Two Large Frick Machines at the Schreiber Brewery, Buffalo, N. Y.

Frick Machines Cool 1½ Million Cu. Ft. of Storage Space, Make 170 Tons of Ice Daily, and Do Air Conditioning at the Gigantic Kansas City, Kan., Food Terminal



226,000 Pounds of Fish and 50 Tons of Ice can be Frozen Daily by the Seven Frick Machines at the new Gloucester, Mass., Fish Pier

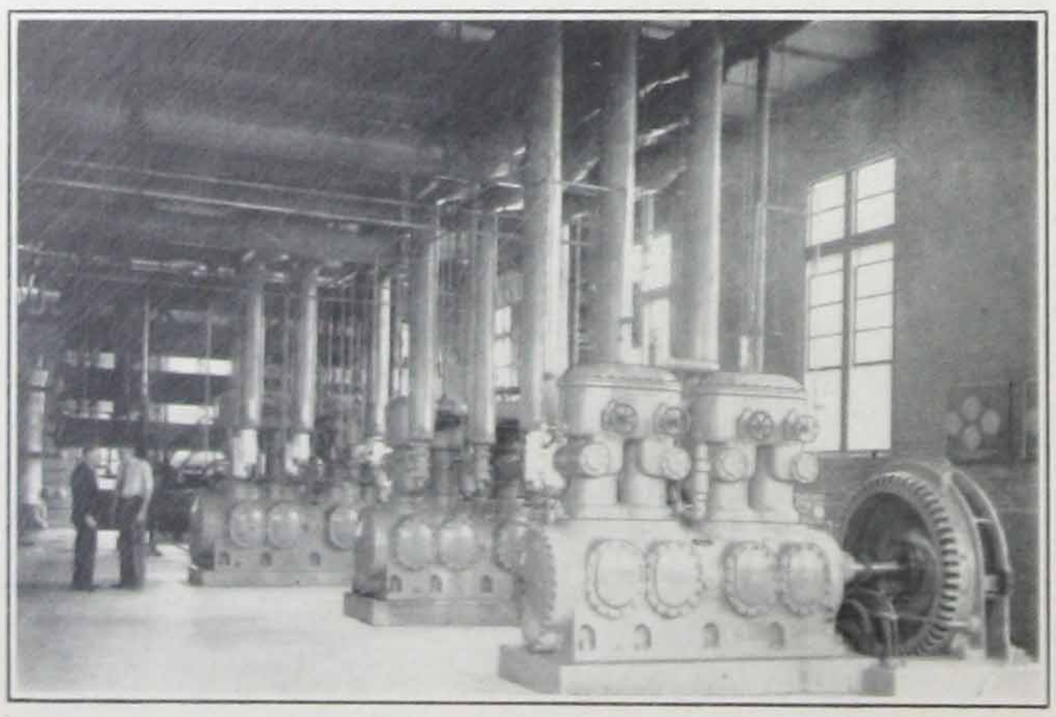
The Food Industries

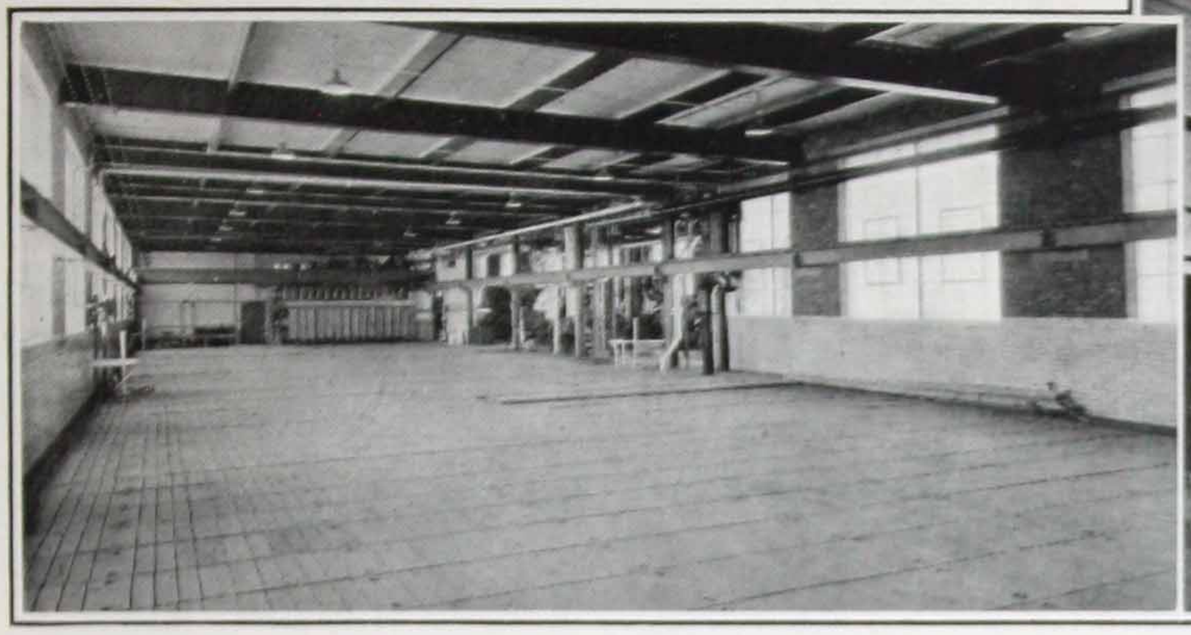
All branches of the Food Industries — including packing houses, dairy and ice cream plants, candy factories, poultry, fish and fruit dealers, breweries and bottling plants, bakeries, markets, and scores of others—use refrigeration as an indispensable aid in handling their products, keeping them fresh and wholesome, and securing the most effective display.

Whether you operate a processing plant, wholesale or retail food business, or transportation line, there is a Frick refrigerating system to fill your exact needs. Our experience with thousands of installations in the food industries saves the user of a Frick machine from costly experimentation, and assures him of the utmost dependability, economy, and permanent satisfaction. The reliablity of Frick enclosed-type compressors is illustrated by the fact that one of the first of these machines to be constructed ran satisfactorily for nearly twenty-five years at Spath's Market, in Portland, Ore. Scores of others have set records for long and continuous operation.

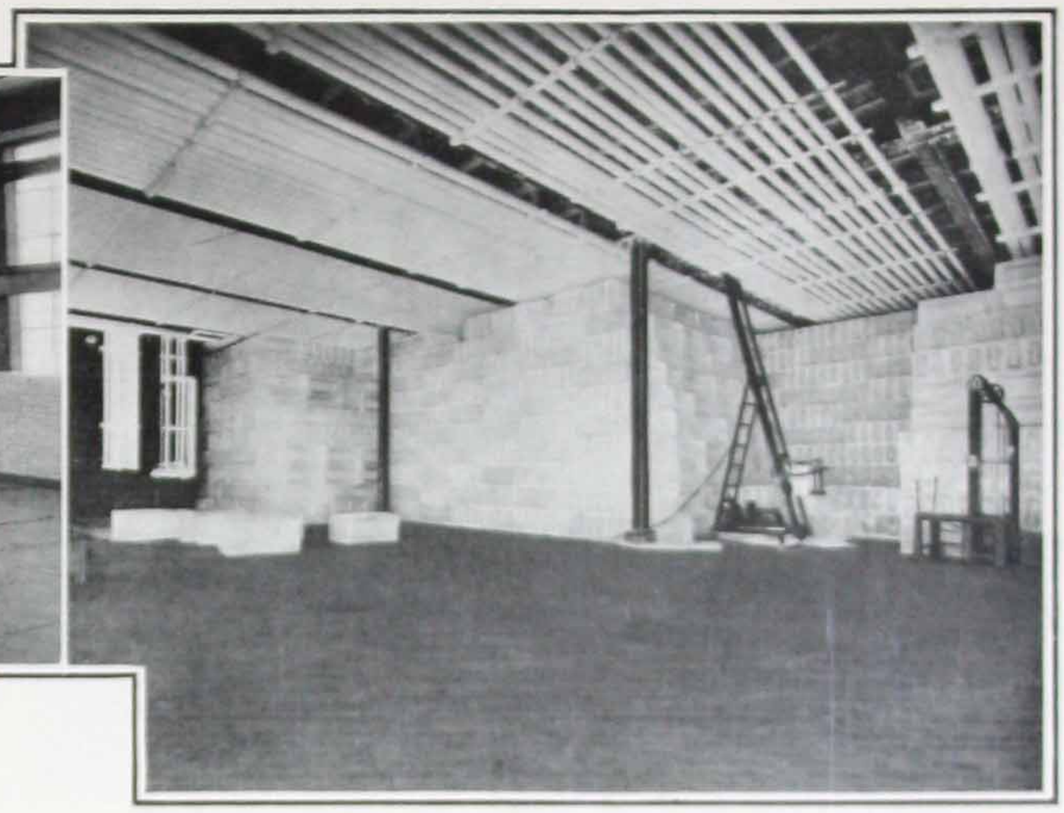
Users will tell you that Frick machines of this type have the qualities needed for day and night, year 'round service in business where adequate refrigeration at all times is a necessity. Standard Frick enclosed compressors, tested by a prominent engineering firm under suction pressures ten times above normal load, proved so satisfactory that the firm ordered several additional machines for the same heavy service. Well known concerns in the food field such as Armour and Swift, Sheffield Farms Dairy, Fleischmann's Yeast, Pacific Fruit and Produce, large chain stores, and others have each ordered from 25 to 575 Frick machines of various sizes.

Frick Refrigeration is Used in this New York Dairy of Sheffield Farms—World's Largest Milk Plant and Distributing Depot





Tank and Machine Room at the Modern Frick Plant of the Walker Ice & Coal Co., Worcester, Mass.



Corner of 3000-Ton Storage of the Framingham and Natick (Mass.) Ice Company

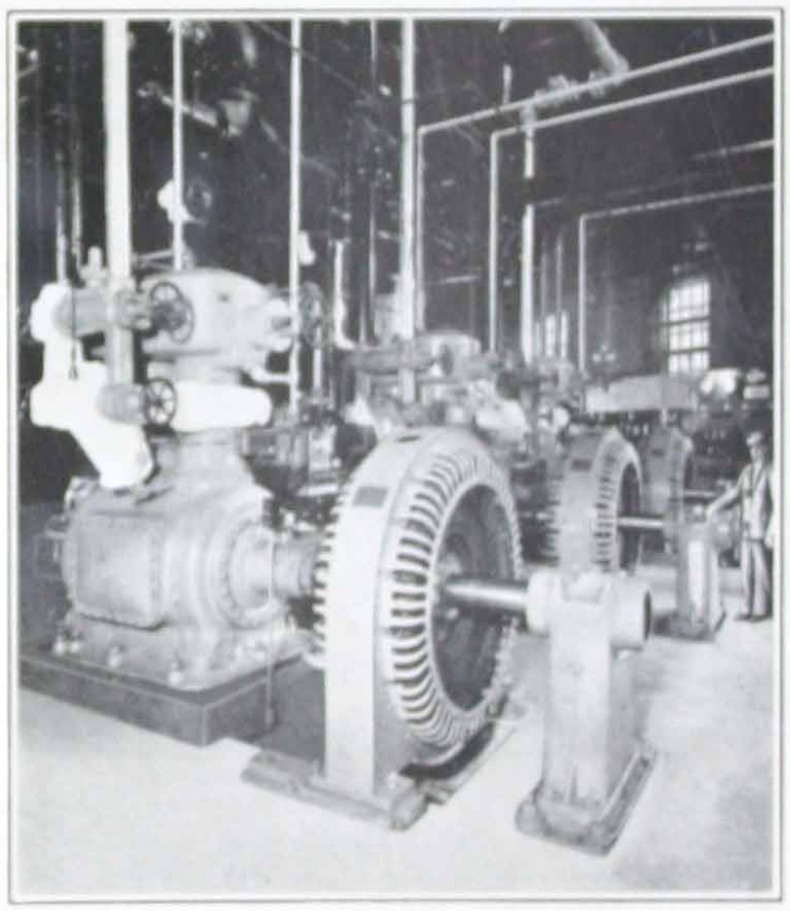
Ice-making & Cold Storage

Frick compressors have been a favorite with the Engineers and Owners of ice and cold storage plants for more than 55 years. For this class of service the enclosed machines, as built today, offer so many special advantages that they are replacing earlier types in hundreds of places —and are paying their own way through savings in labor, maintenance and power, as well as in first cost, space occupied, and other fixed charges.

Consider also the greater flexibility obtained with these compressors through the choice of several drives, division of the load between two or more units, application of capacity controls, operation under two suction pressures, automatic starting and stopping, etc. See other pages of this bulletin.

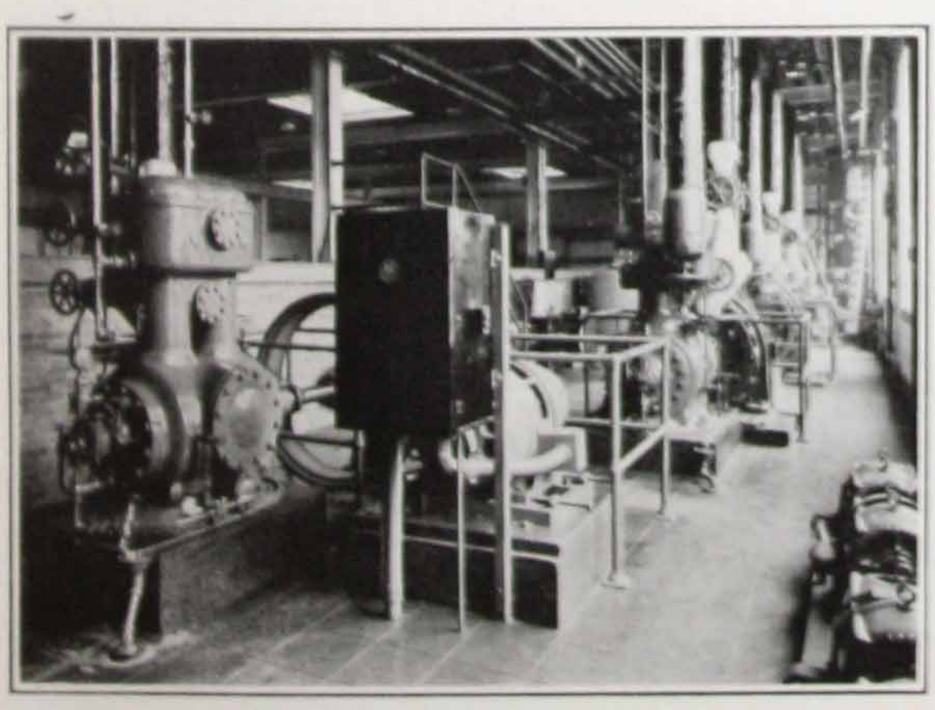
The wide range of available sizes makes these enclosed compressors applicable alike to plants producing from a few tons of ice a day, to the 400 tons being manufactured in a Brooklyn, N. Y., plant where ten Frick 10 in. by 10 in. machines are installed. Combined with the F-P low pressure air system, Frick can grids, unit type evaporators, float valve control, ALL-WELDED ice cans, the ice saver dump, adjustable pressure type can fillers, and improved auxiliaries, these compressors provide Frick customers with complete ice-making equipment of the most advanced and efficient design.

Cold storage, in the same way, can now be equipped with Frick enclosed compressors and modern automatic controls, which accurately maintain temperatures in the various rooms with much less refrigerating capacity and labor than heretofore thought possible. Witness the experience of the plant illustrated at right.

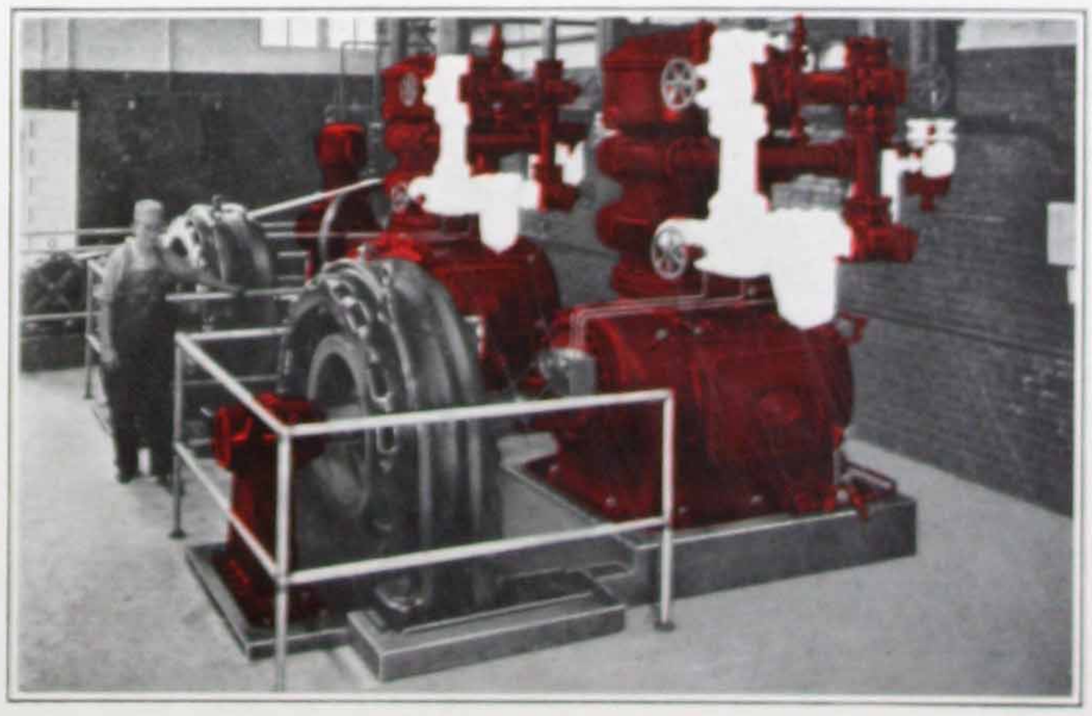


Noel and Co., at Nashville, Tenn., Save $20,000 Yearly on Power with a Frick Ammonia Booster System and the Enclosed Machines Illustrated

Five Enclosed Compressors at the 200-Ton Plant of Cirillo Bros. Ice and Coal Co., Brooklyn, N. Y.



Dual-Pressure Machines at the Knoxville Plant of the Atlantic Ice and Coal Co.



The National Hotel, Havana, which has Figured largely in Cuban Events, is equipped with Two 9 by 9 Frick Machines

Girard College, in Philadelphia, has Frick Refrigerating and Ice-Making Systems in three of its Buildings

Architectural Work

Refrigeration is now employed in large buildings for half a dozen well recognized services, which include:

Conditioning the air in dining and meeting halls, offices, shops, etc.

Cooling drinking water for fountain, pitcher and tumbler outlets.

Making ice and ice cubes for table and room service.

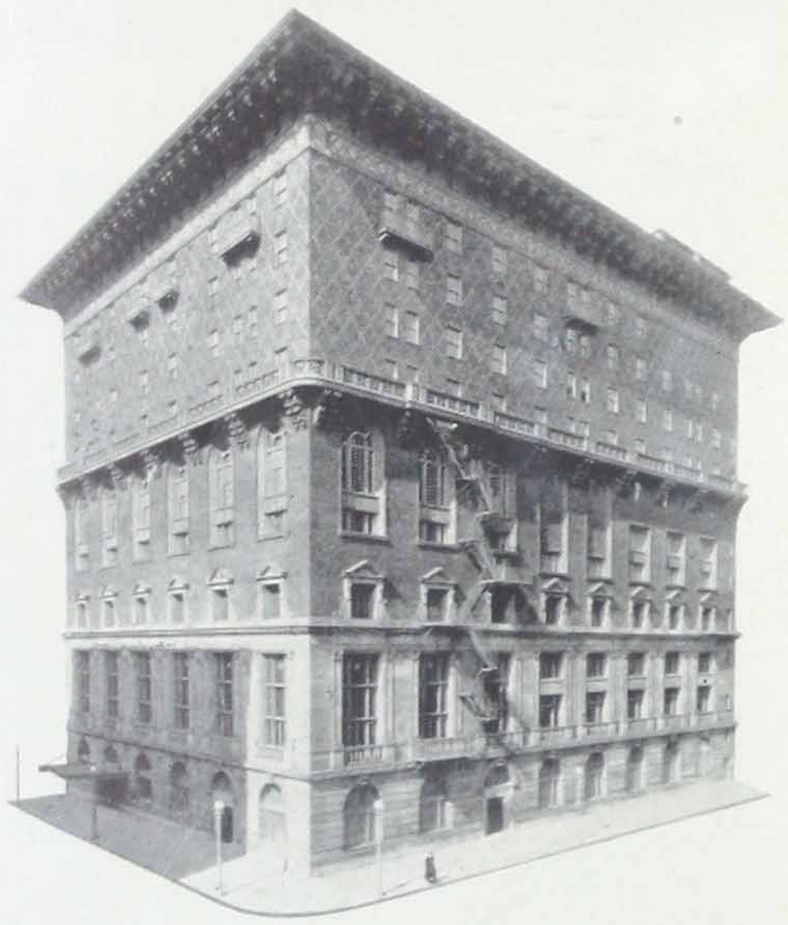
Freezing ice cream and other frozen desserts.

Supplying "cold" for soda fountains, beer bars, confectionery, flower and fur shops.

Holding specified temperatures in any number of refrigerators, fish boxes, freezer rooms, salad counters, short order cases, and so on.

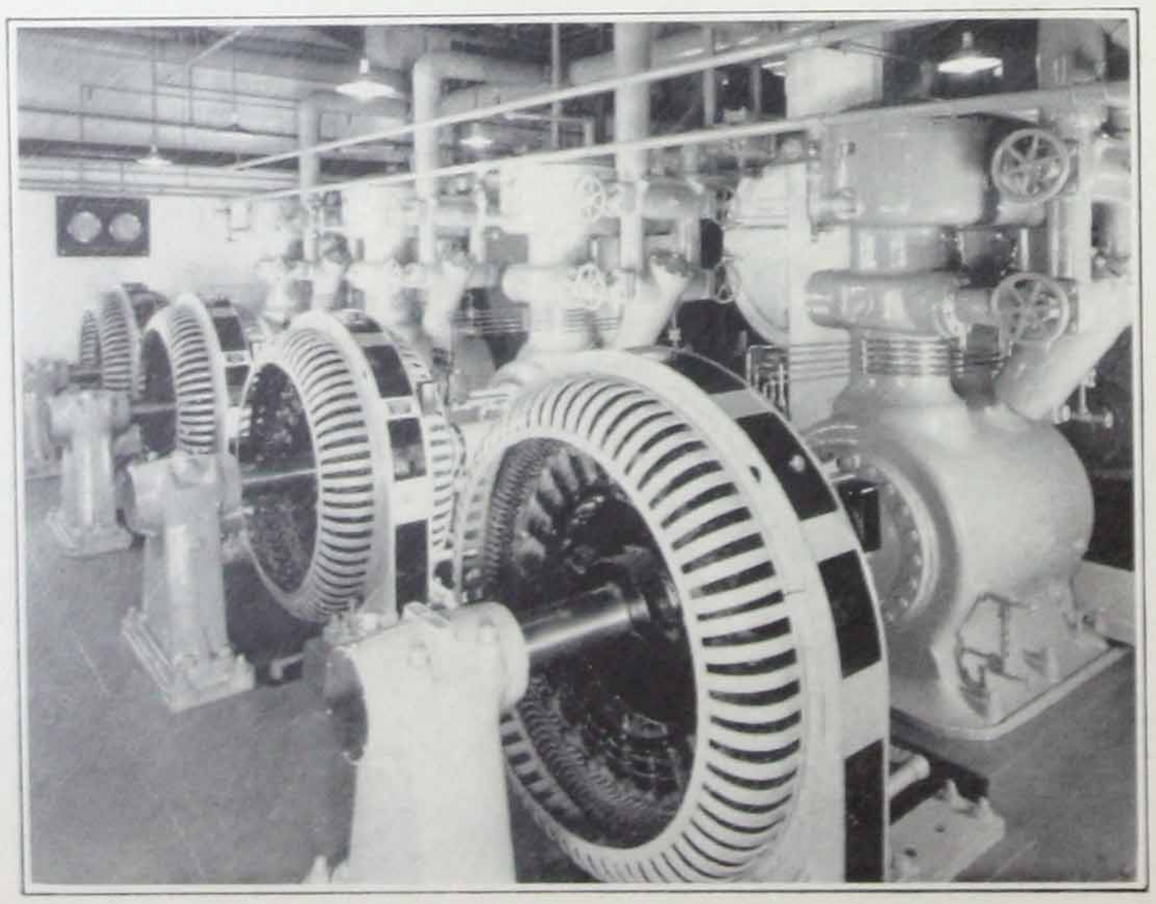
Frick ammonia machines have been selected to perform these services in thousands of the world's finest structures—notable hotels, apartments, clubs, hospitals, office buildings and institutions. Many imposing industrial buildings are also equipped with Frick cooling systems.

Architects and Engineers alike appreciate the sound engineering, satisfactory operation and pleasing appearance which characterize the Frick compressor. Where refrigerating equipment with honest, built-in quality is wanted, Frick machinery can be specified with the knowledge that its performance will be equal to its good reputation. Our Sales Engineers are glad to place their experience in solving refrigeration problems at the disposal of Architects and Consulting Engineers. We offer a complete refrigeration service—recommendations, layouts, designs, manufacture, installation, test and maintenance. Frick Branch Offices, Distributors and stock points in over 175 cities afford every facility to those interested.

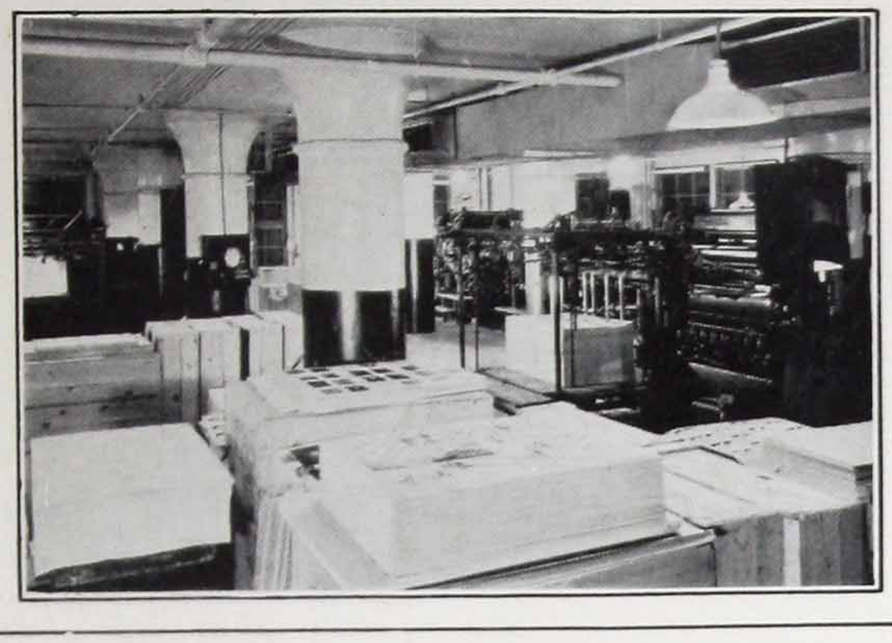


Frick Ammonia Compressors Furnish 357 Tons of Refrigeration for Air Conditioning, Ice Making, and Food Service at the St. Louis Athletic Club

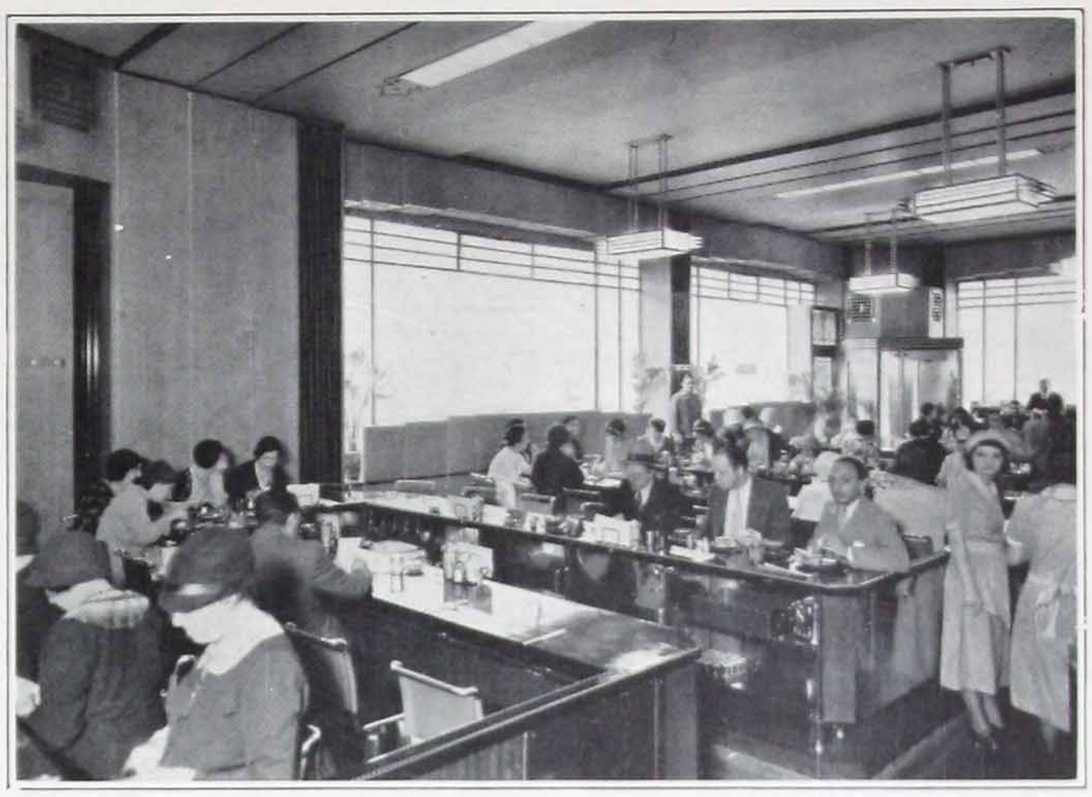
Four Frick 12 by 12 Ammonia Compressors, Equipped with Flexo-Seals, Supplying 1000 Tons of Refrigeration for Air Conditioning the Philtower and Philcade Buildings in Tulsa, Okla.



The St. Vincent De Paul Hopital, St. Louis, is Typical of Hundreds Using Frick Ammonia Refrigeration



Conditioned Air and Frick Refrigeration Aid the Ed. Stern Co., Phila., in Producing Fine Printing



Restaurants, Dining Halls and Cafeterias Can Now Enjoy Air Conditioning at Little Expense

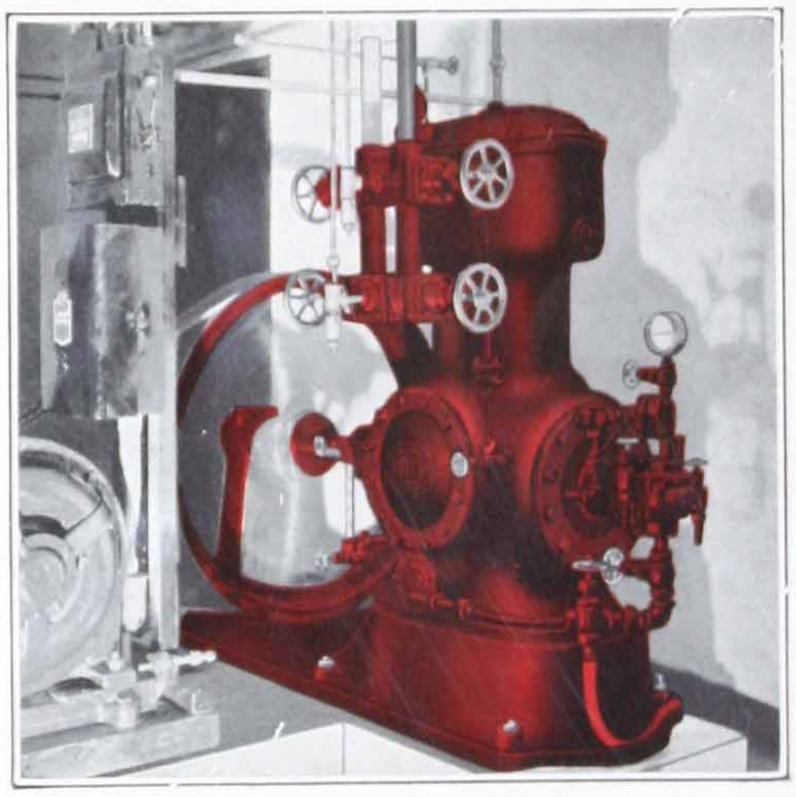
Air Conditioning

Ten or fifteen years ago air conditioning was considered a luxury which could be afforded by only a few establishments. Today it is looked upon as a necessity in such places as restaurants, theatres, hotels, department stores and shops, banks, offices, churches, schools, trains, steamships, etc.

The interest, appetite and enjoyment of customers is stimulated by the fresh, clean air in constant circulation; the freedom from street noises, excessive heat and humidity, odors, dust and dirt also makes an instant and permanent appeal—that pays. Restaurants report increased summer patronage up to 300 per cent, with an operating expense for air conditioning as low as ¾ cent per meal per person.

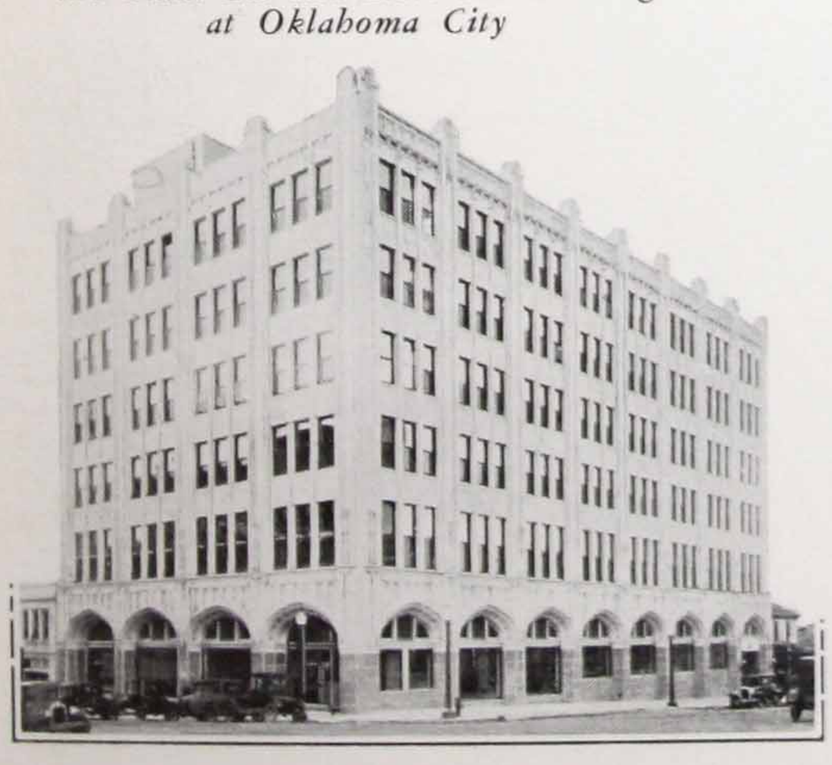
To the average man-in-the-street, air conditioning means comfort cooling in summer. The temperature of the air in most places has actually to be cooled only 10 or 12 degrees below the outside temperature to produce comfort conditions, but it is desirable to maintain the relative humidity of the air around 50 per cent; as this also involves cooling (to condense out the moisture) refrigeration may be said to be the main factor in most air conditioning plants.

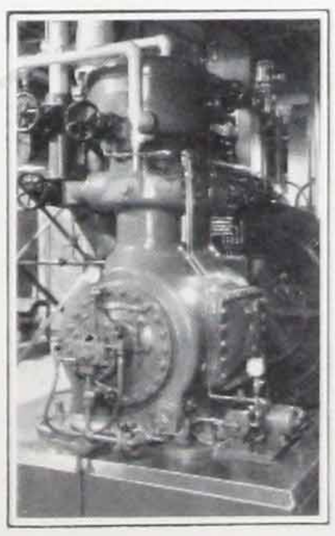
The problem then resolves itself largely into finding the most effective and economical refrigerating equipment for the cooling work at hand. Frick ammonia compressors of the type here described are doing eminently satisfactory work on scores of important air conditioning jobs. As builders of machines for ammonia, carbon dioxide, methyl chloride and Freon-12, we are in an unbiased position in recommending the kind of refrigeration best suited to your needs. Send your inquiry to the nearest Frick Office: it will receive expert attention.

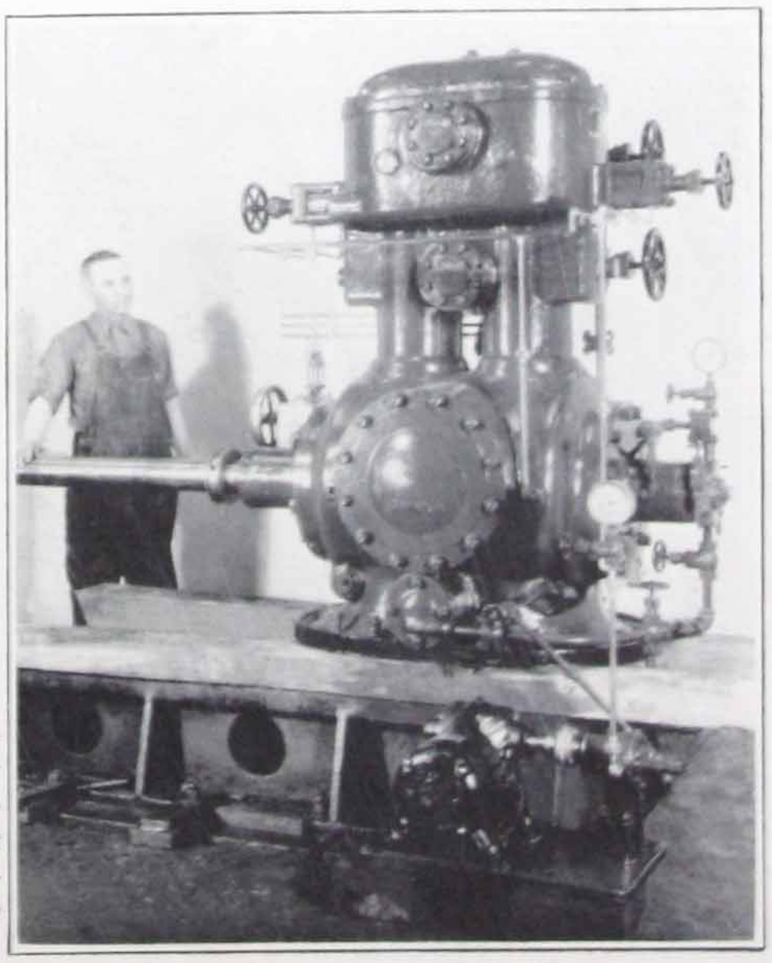


Schrafft's Restaurant at Newark, N. J., Uses this and Two Other Frick Compressors for Air Conditioning and Food Service. This Famous Chain has Over 145 Frick Machines

Three Frick Ammonia Compressors Carry the Cooling Load for Air Conditioning in the Okla. Gas and Elec. Co. Building at Oklahoma City

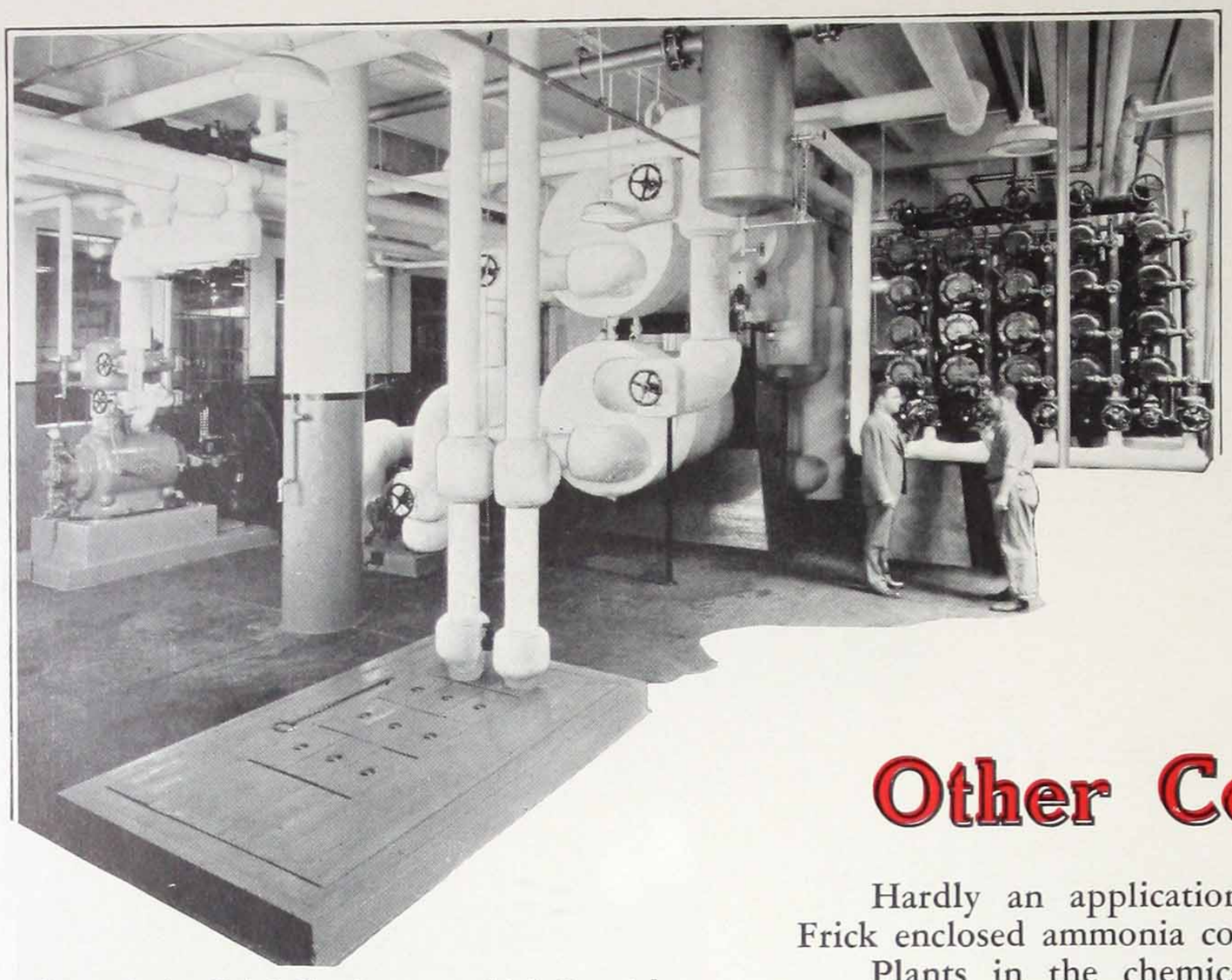




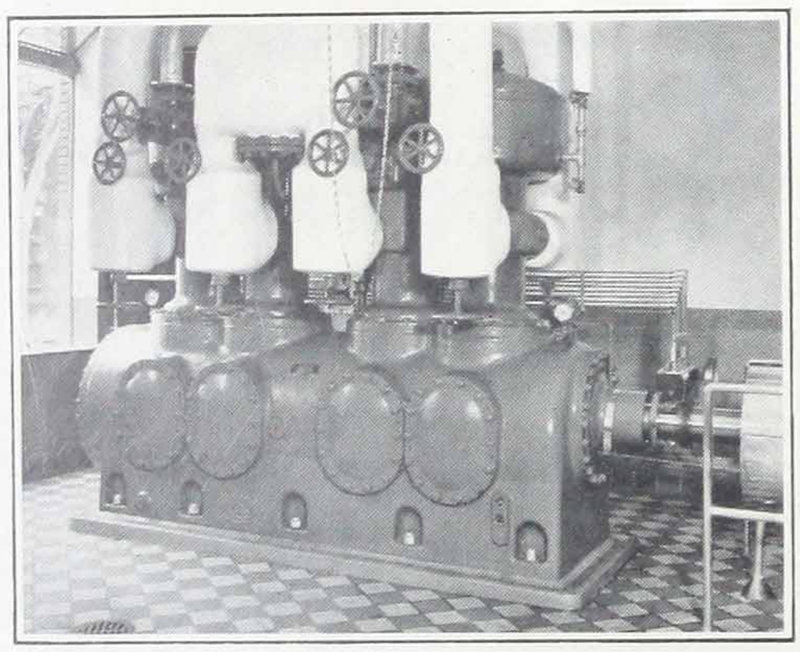


One of Two 8 by 8 Ammonia Compressors, Arranged with Automatic Capacity Controls, for Air Conditioning the G. C. Murphy Store at East Liberty, Penna. Similar Equipment is Used in the Murphy Store at Harrisburg, Penna.

ICE AND FROST

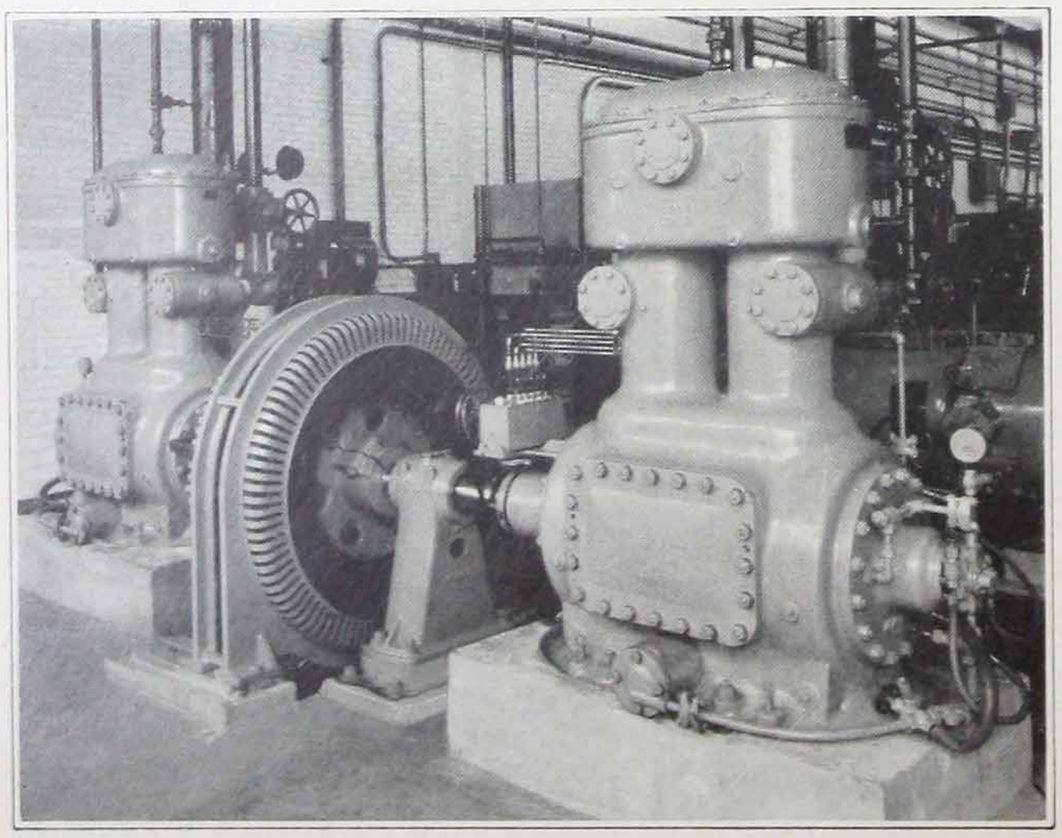


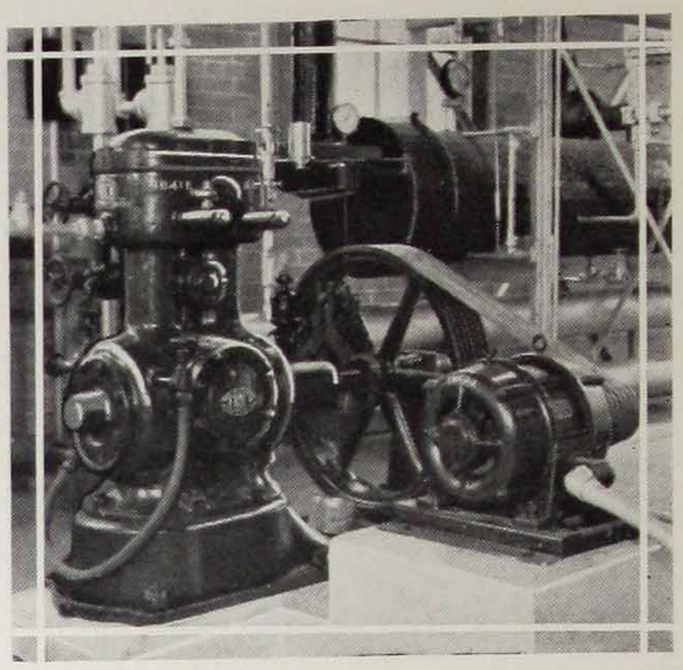
Part of the Frick Equipment which Furnishes Refrigeration for a Dozen Distinct Services in the Pharmaceutical Plant of Sharp & Dohme, Philadelphia



12 by 12 Four-Cylinder Compressor at the Pfeiffer Brewery, Detroit

10 by 10 Compressors used by the American Enka Corp. for Making Rayon at their North Carolina Plant





The University of Alabama is one of Many Colleges Using Frick Machines for Test and Research. Note Thermometers and Indicator

Other Commercial Uses

Hardly an application of refrigeration can be named, but that Frick enclosed ammonia compressors are being used in it.

Plants in the chemical industries, making such products as explosives, artificial silk, glue, gasoline, lubricating oil, rubber goods, mercerized cotton, films, vaccines, etc., find these machines have the sure dependability and ease of handling, and give the close temperature regulation, so necessary for successful work.

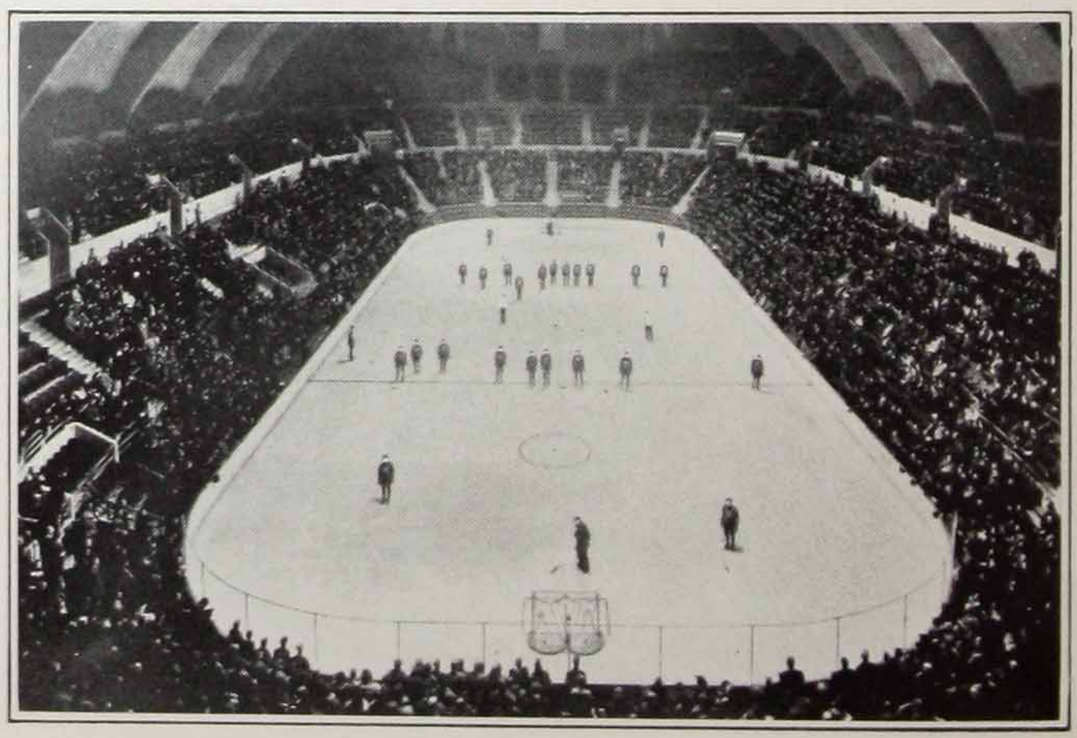
The compressors are equally valuable aids in factories producing cigars, linoleum, waxed paper and candles, tempered tools, instruments of various kinds, golf balls, and so on.

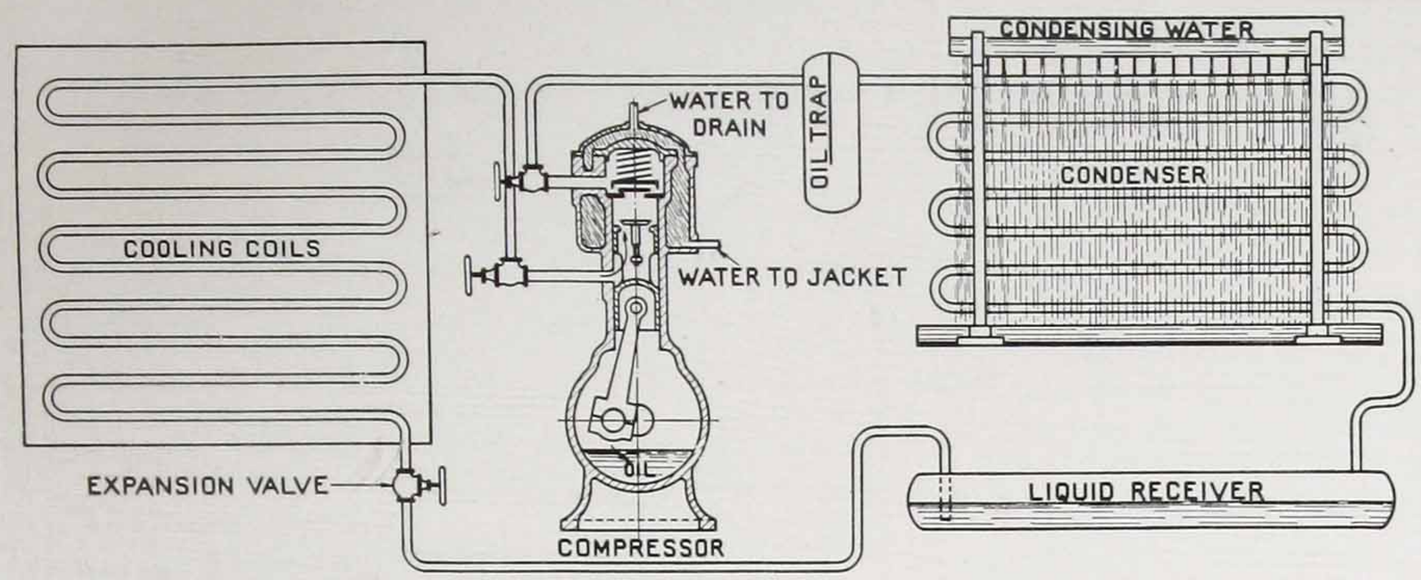
For quick-freezing work they adapt themselves to plants operating either at moderately low temperatures, or to those where extreme cold is required: for the latter we recommend a two-stage ammonia plant with a booster compressor as described in Ice and Frost Bulletin 516.

For experimental and test work in laboratories, colleges, government bureaus, etc., these units have won many friends because of their uniform performance, and ready adaptability to unusual conditions.

The machines are in daily satisfactory service on scores of miscellaneous installations, where efficient refrigeration is essential to profits; these jobs include marine work, skating rinks, drinking water systems, zoological gardens, fur storages, morgues, paint, perfume and packing plants, and dozens of others. Frick engineers will gladly assist in solving your special problems.

Half the Artificial Ice Skating Rinks in the Country, Including the Big One at Hershey, Penna., Use Frick Equipment





Elementary Diagram of the Refrigenating Cycle, Using the Compression System

Principles of Refrigeration

The essential parts of a refrigerating plant are the compressor, condenser, receiver, expansion valve, and cooling coils: suitable pipe lines, with the necessary shut-off valves, connect one part to another.

The air is first pumped out and the system is then charged with ammonia—a clear liquid looking like water. While water boils at a temperature of 212 degrees in the open air, ammonia under atmospheric pressure will boil at 28 degrees below zero F. Ammonia has a strong suffocating odor, but is not poisonous and can be used with entire safety in properly made equipment.

The liquid ammonia is held in the receiver under about 185 lb. gauge pressure, and from there is fed into the cooling coils in a fine stream by means of a regulating or expansion valve. In the same way that boiling water absorbs heat from a fire, and sends it off in the form of the gas we call steam, the liquid ammonia takes up the heat from the pipe coils and evaporates into ammonia gas. By constantly drawing off the gas from the pipe coils, we make them so cold that they chill the air and products around them, and by condensing and freezing part of the moisture in the air, produce the white frost often seen on the pipes.

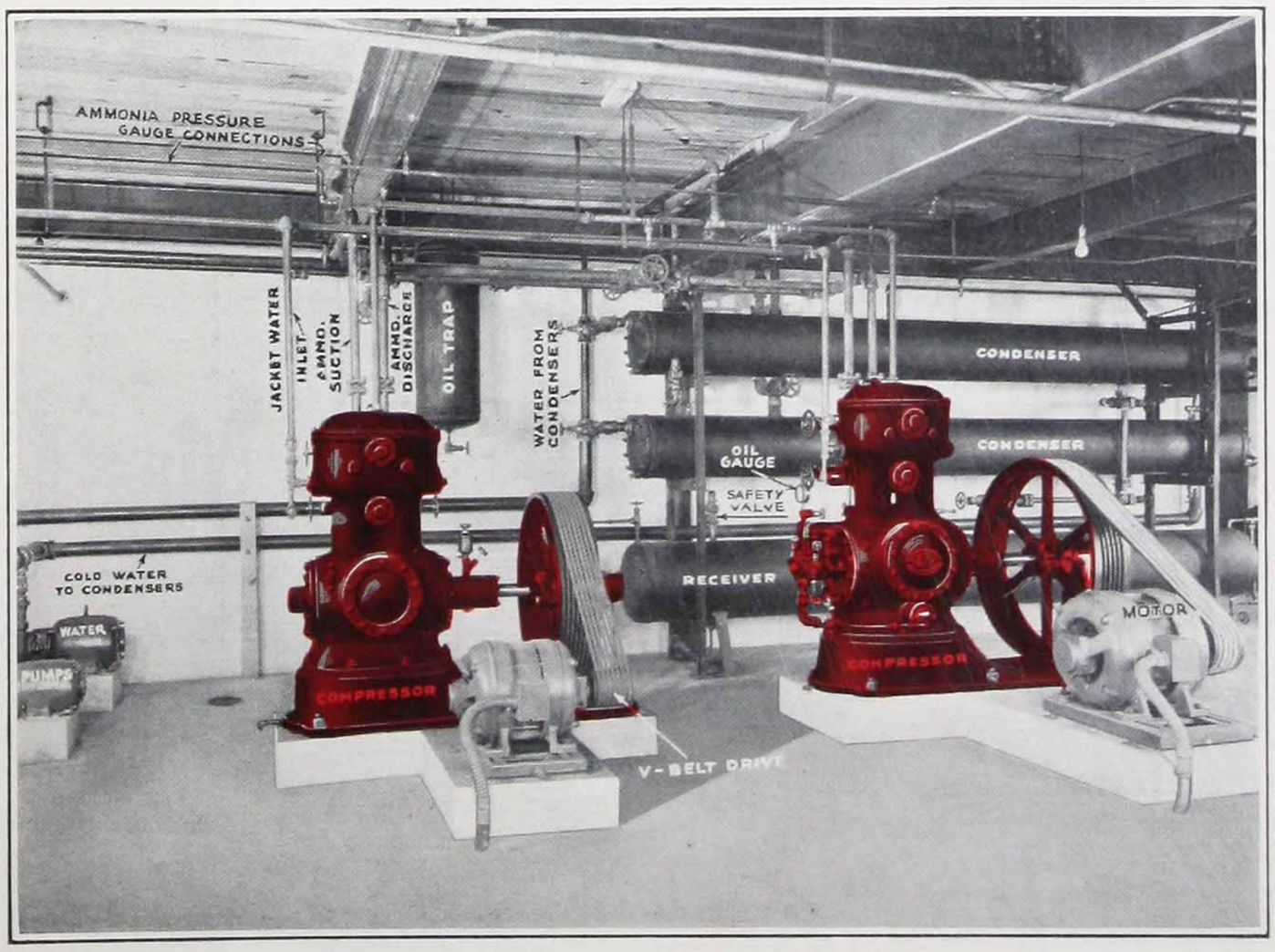
As fast as the ammonia gas is formed it is drawn into the compressor, which maintains an average "suction pressure" in the coils of 15 to 25 pounds. The compressor, which is really a gas pump designed for handling ammonia, raises the pressure of the ammonia gas to about 185 pounds again, and forces it into the condenser. The work done on the gas has meanwhile raised its temperature to say 200 degrees F. In the condenser the hot ammonia is cooled by tubes carrying cold water, the effect of which is to change the gas back to liquid form, ready for returning to the receiver and being used again.

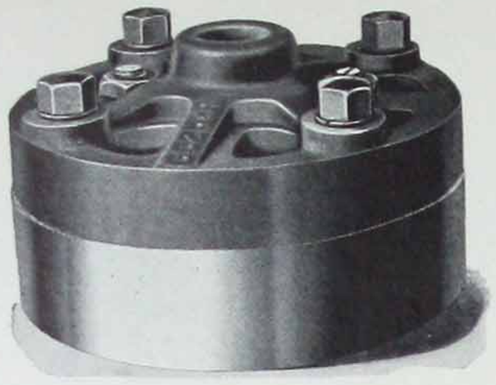
The power required for driving the compressor is less, in proportion to the cooling effect, if the suction pressure is kept as high as possible (while still producing the cold temperatures desired.) By feeding the refrigerant into the bottom of the coils or coolers they can be kept "flooded" with liquid ammonia: flooded operation naturally increases the heat transfer and maintains a higher suction pressure. Suitable float valves, automatic expansion valves, and electric control valves are now generally used in place of hand expansion valves, for governing the ammonia feed. Thermostats and special electric controls are similarly used for starting and stopping the compressor automatically, when desired. Self-opening unloaders can be used to relieve the head pressure, on large machines, until they have come up to speed. For efficient operation the head or condensing pressure should of course be kept as low as the use of ample cold water and generous tube surfaces in the condenser will economically allow.

The capacity of a refrigerating machine depends largely upon the number and size of its cylinders, its speed when running, the efficiency of compression, the suction and discharge pressures, and the number of hours of operation per day, the rated capacity being always based on continuous operation through the 24 hours. Machine ratings are usually based on the conditions adopted as standard by the American Society of Refrigerating Engineers, which are 5 deg. F. and 19.6 lb. gauge pressure for the suction, and 86 deg. F. and 154.5 lb. gauge for the discharge.

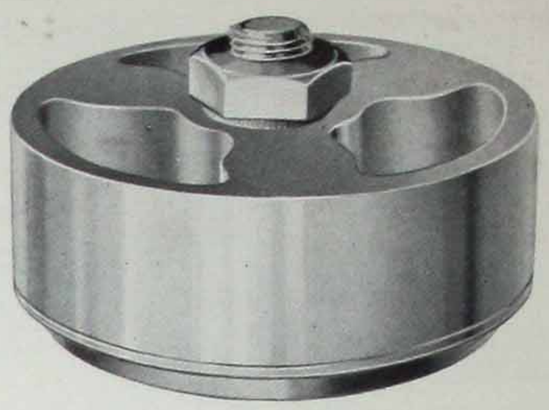
One Ton of Refrigeration is about equal to the cooling effect obtained when a ton of ice, weighing 2000 pounds, is melted in 24 hours. To be exact, 1 T. R. equals 288,000 British thermal units (or B. t. u.) per 24 hours. This is cooling at the rate of 200 B. t. u. per minute. It is usually figured that from 1.4 to 1.6 tons of refrigeration are required to make one ton of ice, as the water must first be cooled to the freezing point, and various other losses have to be considered.

Illustrating the Parts of the High-Pressure Side of a Typical Refrigerating Plant, Using Two Compressors, with Shell and Tube Condensers





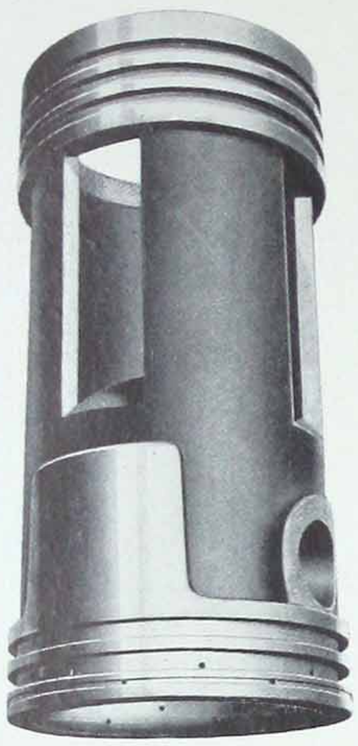
Safety cylinder heads, held down by heavy springs instead of bolts, lift in case slugs of liquid ammonia enter: wasteful clearance space is thus safely eliminated.



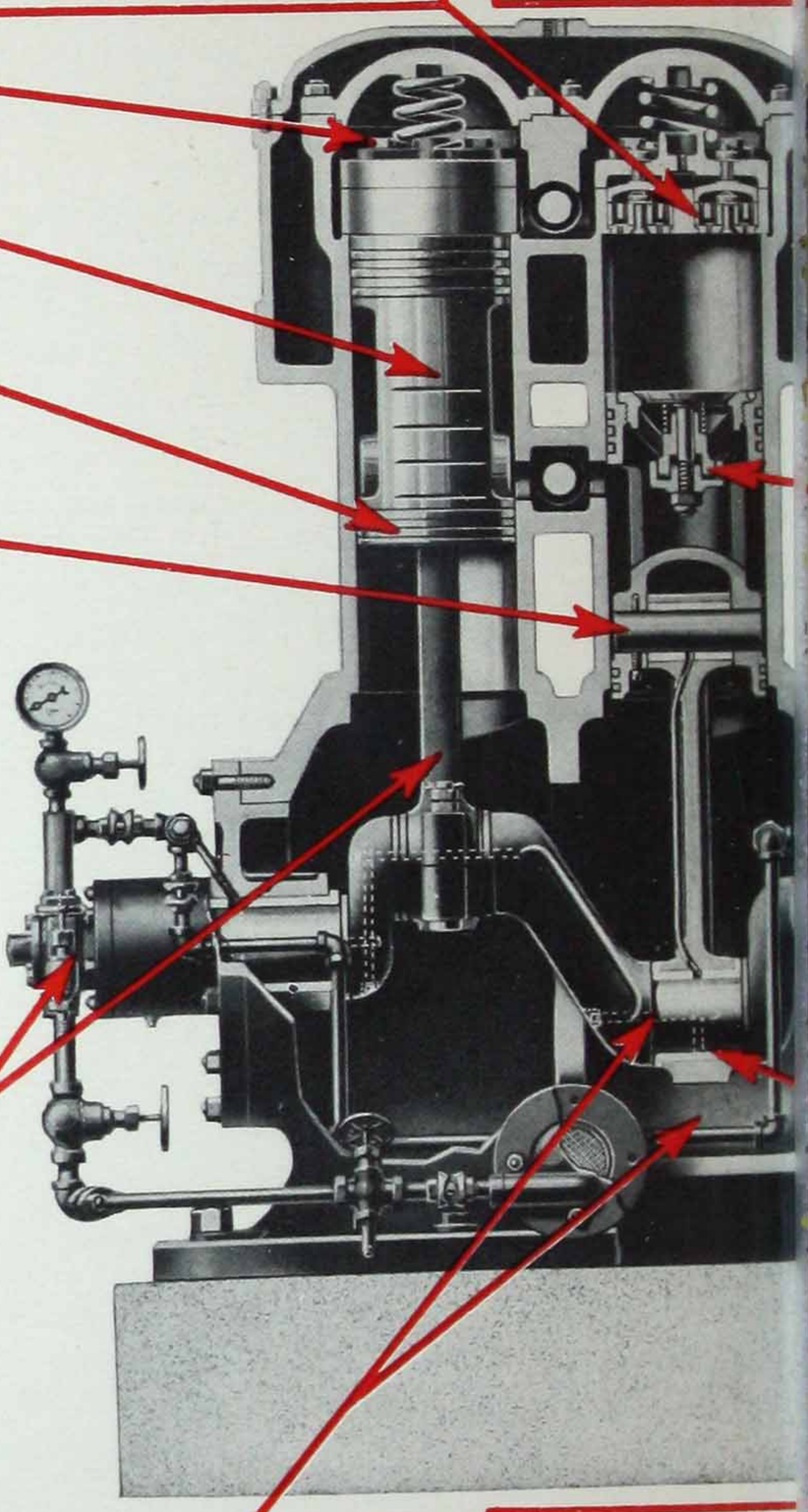
Pistons ground to size and made unusually long: suction ports uncovered throughout stroke. Ample thrust surfaces opposite piston pins. 9 by 9, 10 by 10 and 12 by 12 machines have babbitted pistons and rings, as shown on page 11.

Plate discharge valves, developed especially for this service. Light moving parts: quiet, tight and reliable. Larger cylinders have multiple valves. Heat-treated ring plates give long useful life.

Large suction scale
in bypass manifol
cleaning, being bet



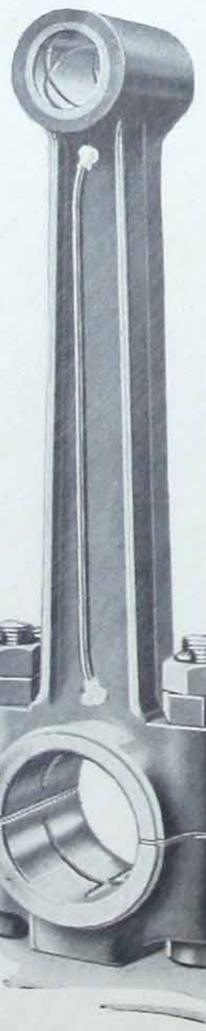
Two special scraper rings remove excess oil through drain holes in piston. Three pressure rings at top. Note arrangement of oil grooves in piston shown at left.



Case-hardened steel piston pins, accurately ground to fit cast iron bushings. Larger machines have hollow pins. Note oil hole in bushing. Lubrication is extra thorough.

Superior workmanship and very best materials insure long life of machines. Castings sand blasted and properly aged. Rigid inspection and tests given all parts, which are made interchangeable. Over 55 years' refrigerating experience built into every compressor. Check the details of these advanced machines against any others. Fully guaranteed.

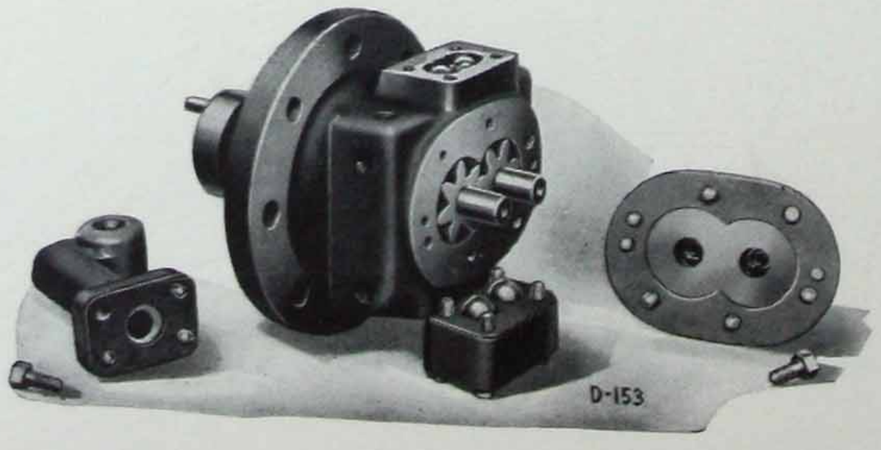
Drop-forged steel connecting rods, made extra long to lessen side thrust on pistons. Crank bearings are marine type, with shims for adjustment. Chrome-vanadium steel bolts secured by lock nuts and pins. H-section rod gives maximum stiffness.

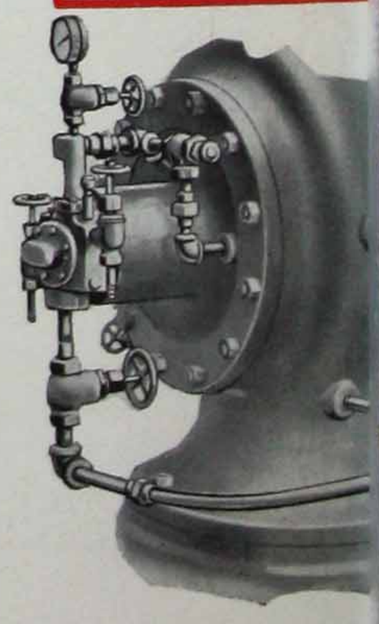


Oiling system features include removable strainer, pump, gauge, relief valve, and piping for oil at two pressures—adjustable spring relief valve passes oil to stuffing box and adjacent bearing. Gear pump operates in either direction and additional oil can be charged into machine while running. Screen in base of crankcase is quickly cleaned.

Force-feed oiling system gives positive automatic lubrication to bearings, cranks, wrist pins and stuffing box. Splash lubrication also maintained in crankcase. Faster running machines have mechanical sight-feed lubricator delivering oil to suction and to cylinder walls.

Greater weight, st
One-piece alignment
crankcase on all sizes
machines. Honed
thick, make the only
are not readily remo





of monel metal,
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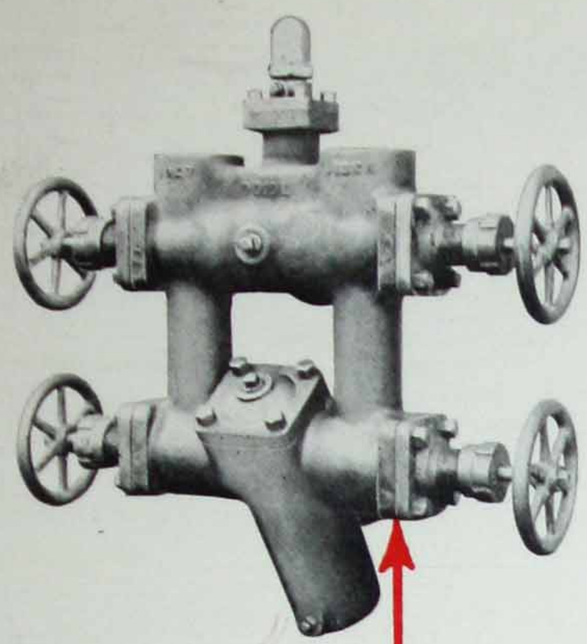
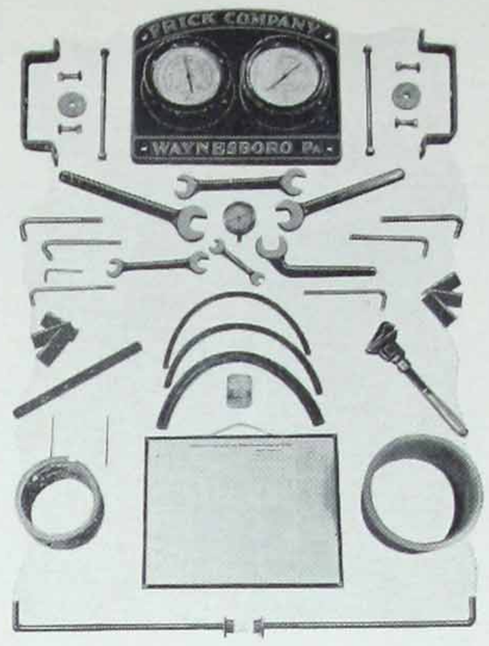


Full-size bypass connections in one-piece manifold. Frick patented tight-closing control valves arranged in simple square pattern, with safety relief valve above and suction screen below. Same size large pipe openings for suction and discharge. Automatic bypass furnished when desired.

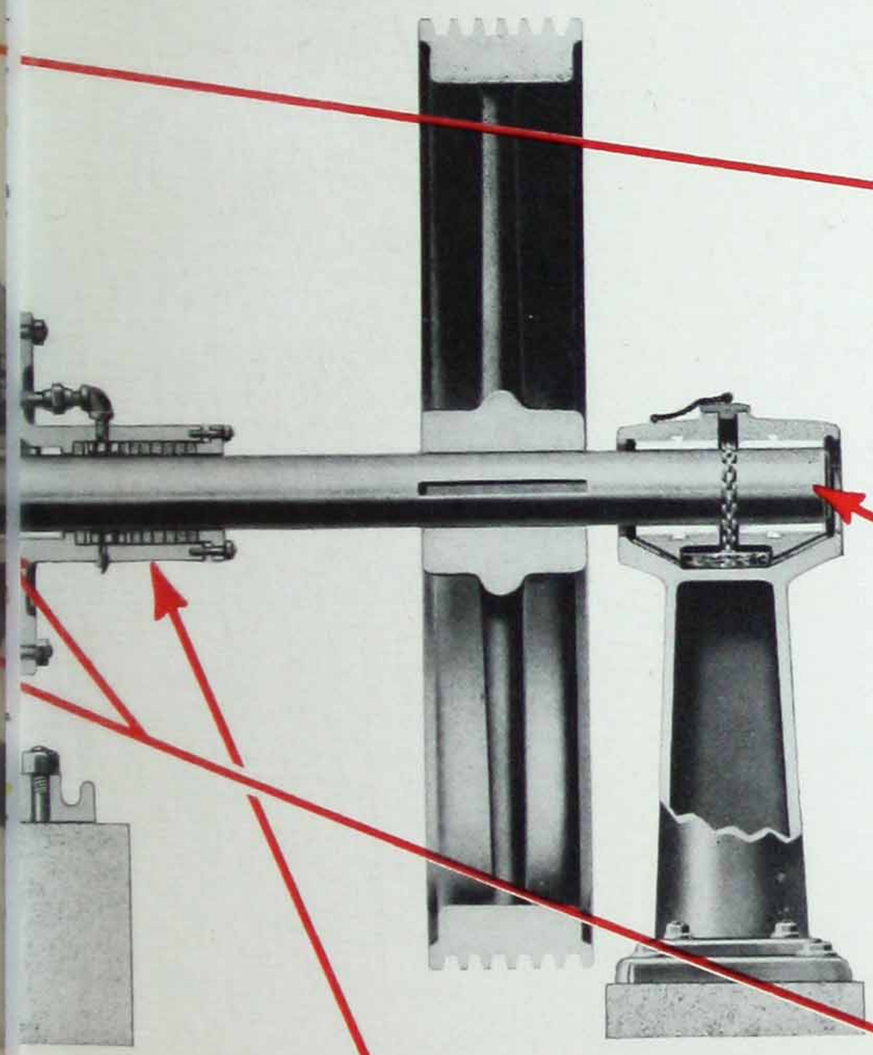
Standard equipment supplied with Frick compressors includes two ammonia gauges mounted on a metal board, packing for the stuffing box, set of wrenches and tools, foundation bolts and wedges, hose for drawing in oil, enameled chart of operating instructions, piston ring guide, and erecting drawings. A template is furnished for setting the anchor bolts on machines without a sub-base.



Complete service — design, manufacture, sales, erection, test and maintenance—by a world-wide organization of refrigerating engineers. Offices in over 175 cities. One responsibility. Full line of ammonia, carbon dioxide and low pressure refrigerating machines makes our recommendations unbiased. Both vertical enclosed and combined unit types of machines.

Water jacket entirely covers cylinder heads, keeping them cool. Cover of jacket made removable to permit cleaning of mud or scale deposited by the water. Two water inlets: outlet at top.

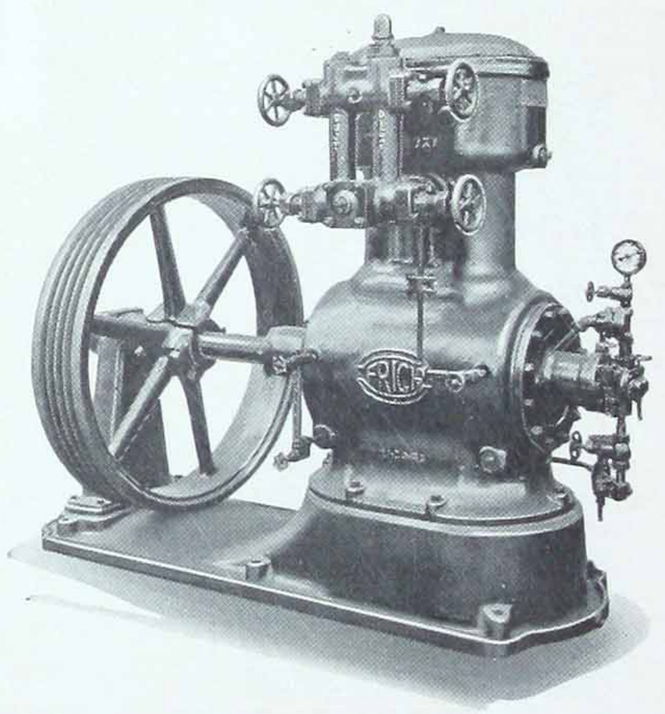
Suction valve is floated by spring and motion is cushioned by dashpot. Valve cages are threaded, screwed into piston, and securely pinned. (No tap screws to work loose.) Multiple suction valves on 6 by 6 and larger machines. Adequate valve opening and quiet action on all sizes. A superior design for a superior machine.



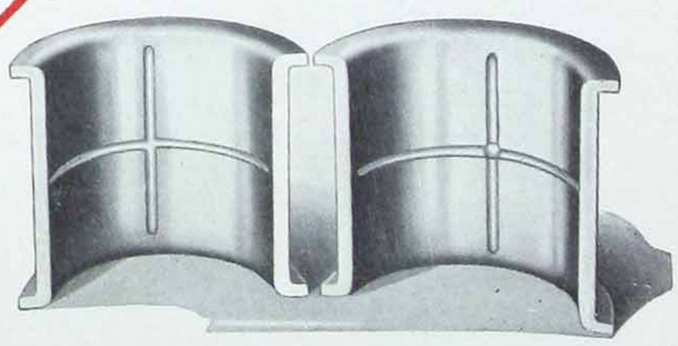
and rigidity.
cylinders and
the 4-Cylinder
walls, extra
surfaces which
ist indefinitely.

Double-length stuffing box with self-adjusting spring serving also as oil lantern. Holds pressure with gland nuts only finger tight. Sealed with oil under low pressure. Frick patented Flexo-Seal available when desired: standard on 3", 4" and 5" sizes.

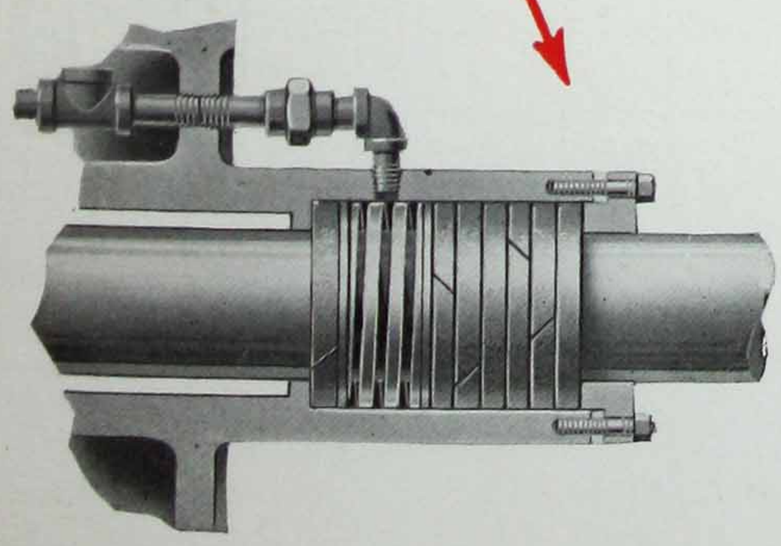
Chain-oiled outboard bearing beyond wheel supports weight of fly-wheel and pull of belt. Base frame, heavily ribbed, supplied on compressors of smaller sizes. Bearing pedestal is long enough to permit removal of wheel.

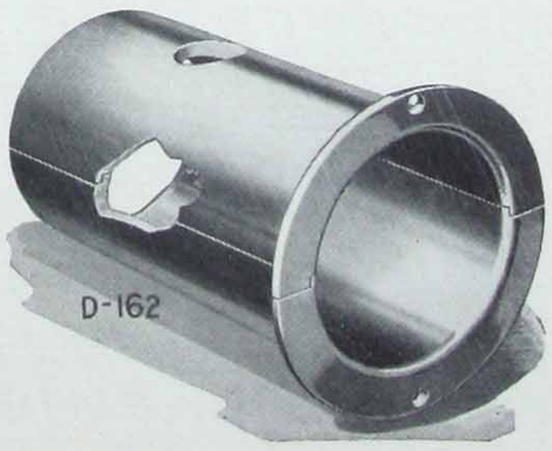


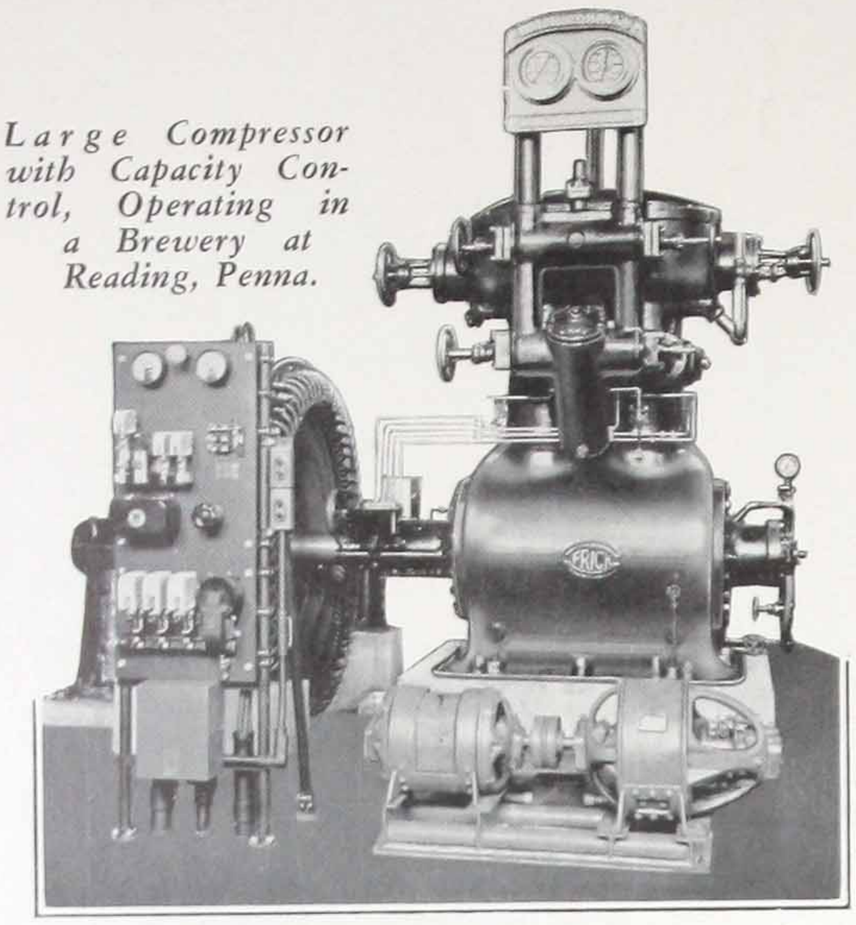
Perfectly adapted to any type of drive: flat or V-belt, direct-connected synchronous motor, steam, oil, or gas engine, tandem coupled, or special drives. Machines built with dual-pressure cylinders or capacity controls when desired.



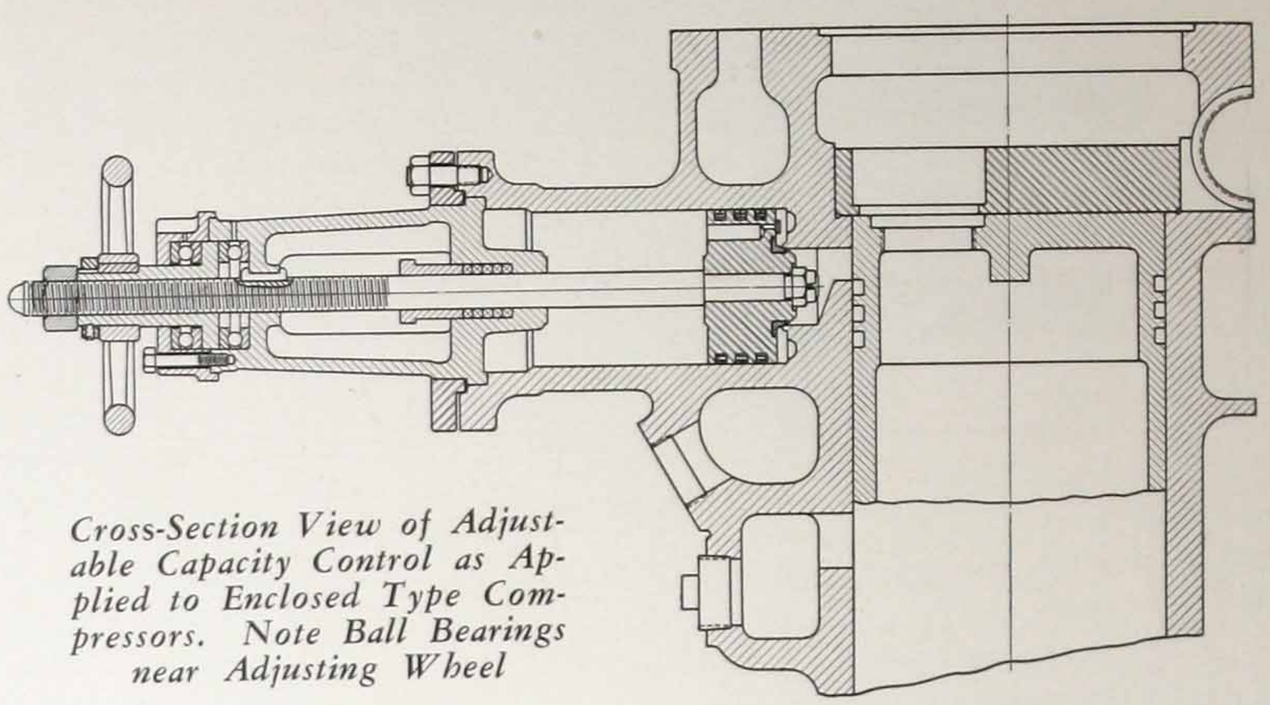
Die-cast bearings of best grade heavy-duty babbitt, surface hardened against wear. Split sleeves make renewal easy. Big-diameter shafts and generous bearing surfaces.







Large Compressor with Capacity Control, Operating in a Brewery at Reading, Penna.



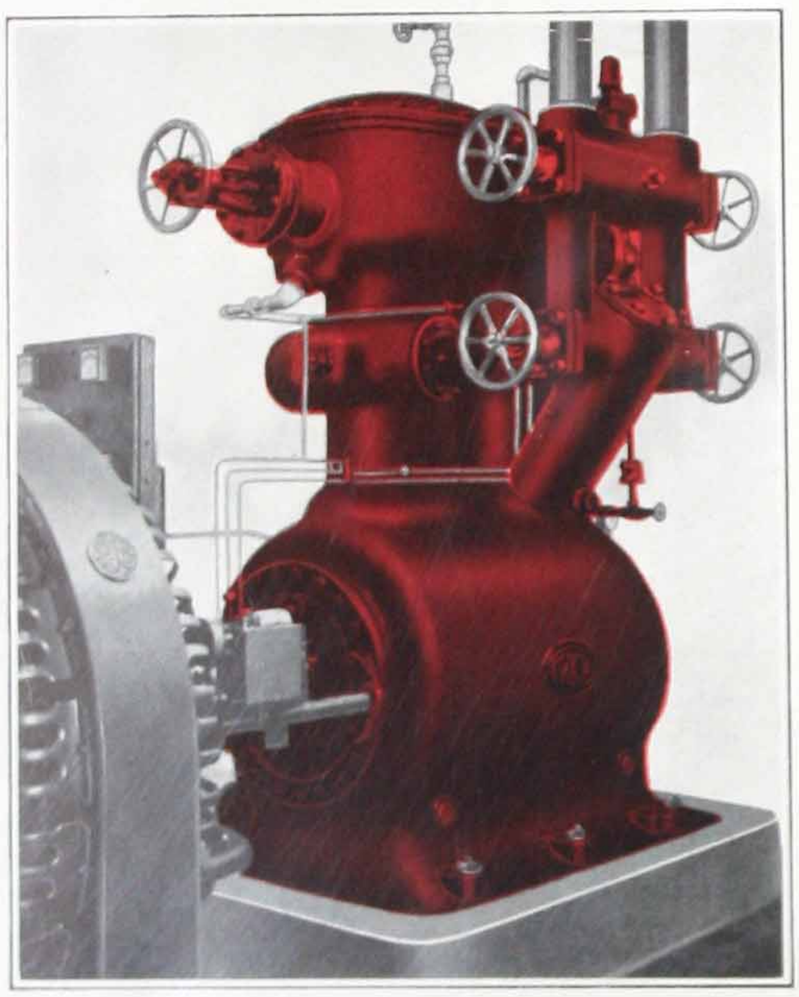
Cross-Section View of Adjustable Capacity Control as Applied to Enclosed Type Compressors. Note Ball Bearings near Adjusting Wheel

Capacity Controls

There is today a well defined demand for compressors with capacity controls, arranged to permit close regulation of the load being carried by the machine without changing its speed or continually starting and stopping it. Control of capacity is particularly useful with machines having synchronous motor or oil engine drive, also where exact temperatures must be maintained; for two-stage compression it is helpful in balancing the work of the different cylinders; it should also be considered for plants operating at partial loads over certain periods.

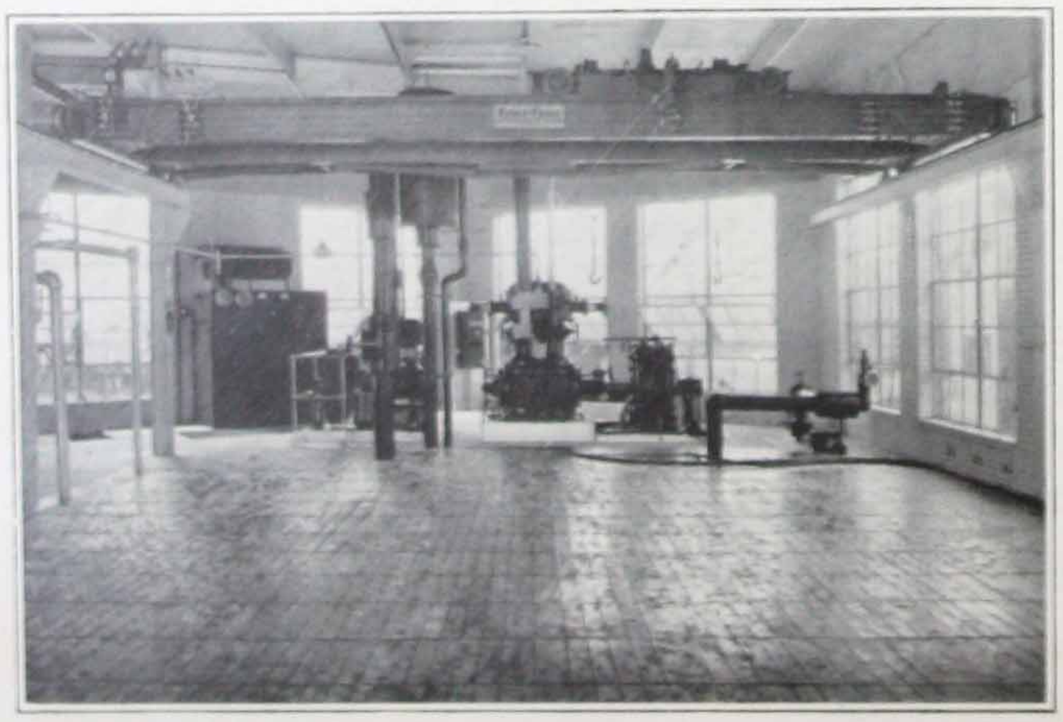
The Frick capacity control is fundamentally an auxiliary cylinder, placed not at the end but between the limits of the stroke of the main cylinder, the piston over-traveling the port leading into the adjustable clearance pocket. This design has proved its advantages over anything else for the purpose. The clearance pocket is arranged so that when fully opened it gives a 50 per cent reduction in capacity. When the clearance valve is first opened, the capacity of the machine is reduced to 80 per cent; by adjusting the position of the piston by degrees, the machine can be made to deliver any fractional portion from 50 to 80 per cent (or the full amount) of its rated output.

Years of experience with this problem have enabled us to produce a capacity control embodying the features of ready adjustment, quietness in operation, and the utmost efficiency. Over-heating is prevented by the water jacket surrounding the working part of the clearance pocket. Ball thrust bearings permit free turning of the hand wheel without objectionable play in the piston stem. A small check valve in the face of the clearance piston allows the gas behind it to pass out when the pocket is being opened.

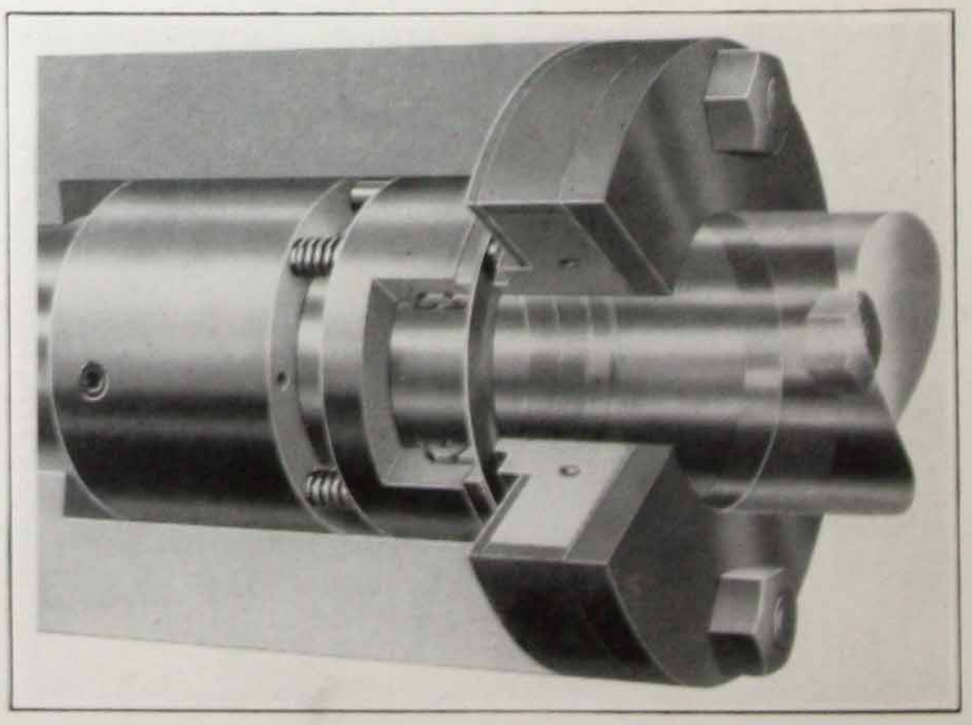


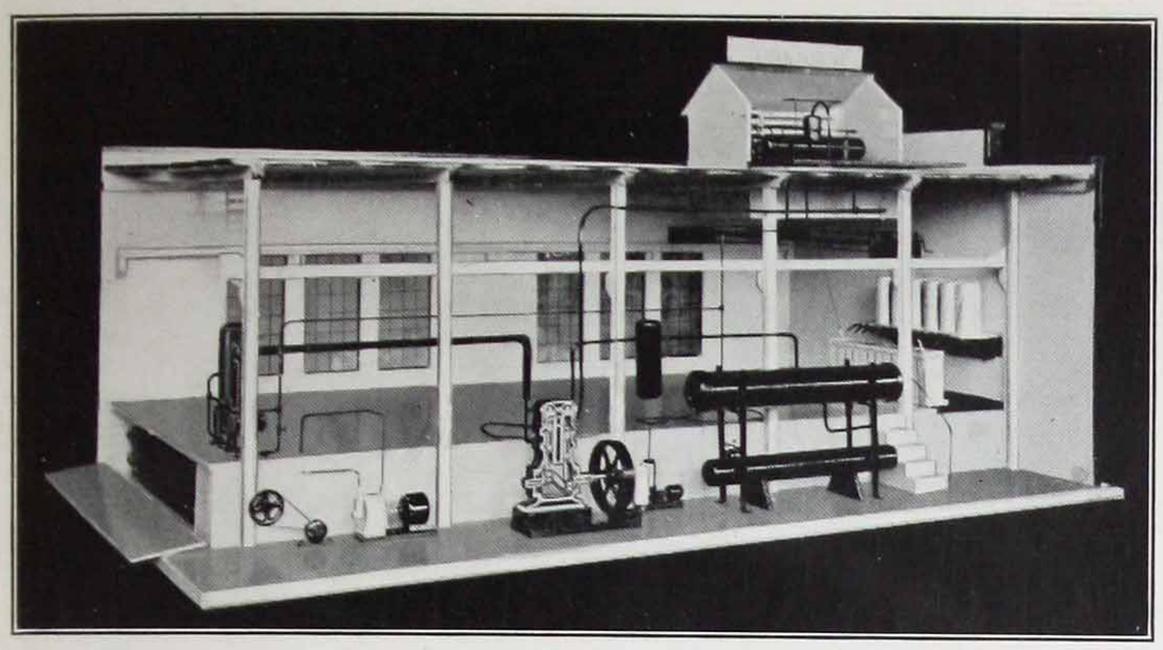
12 by 12 Machine with Capacity Control—One of Six Frick Compressors at the Great Chestnut Farms Dairy, Washington, D. C.

Typical Ice-Making Plant with Compressor Having Capacity Controls

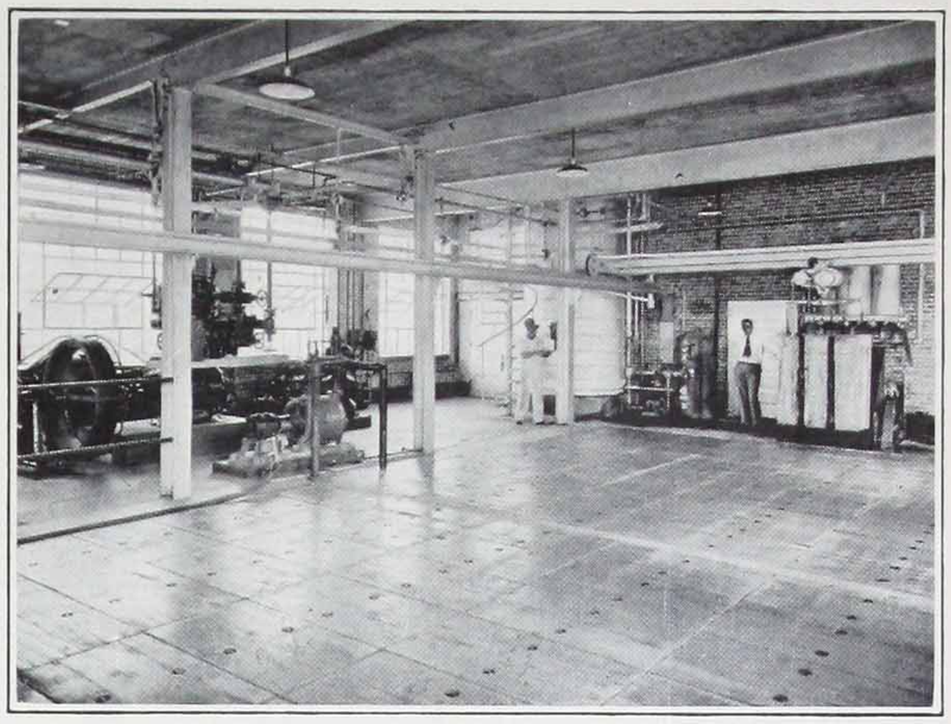


The Patented Frick Flexo-Seal is Available for Ammonia Compressors when Desired: Needs no Attention When Starting or Stopping Machine





Model of 50-Ton Dual Pressure Ice Plant, Showing Water and Ammonia Precoolers in Penthouse



28-Ton Dual-Pressure Plant of the English Ice Co. at Lawton, Okla.

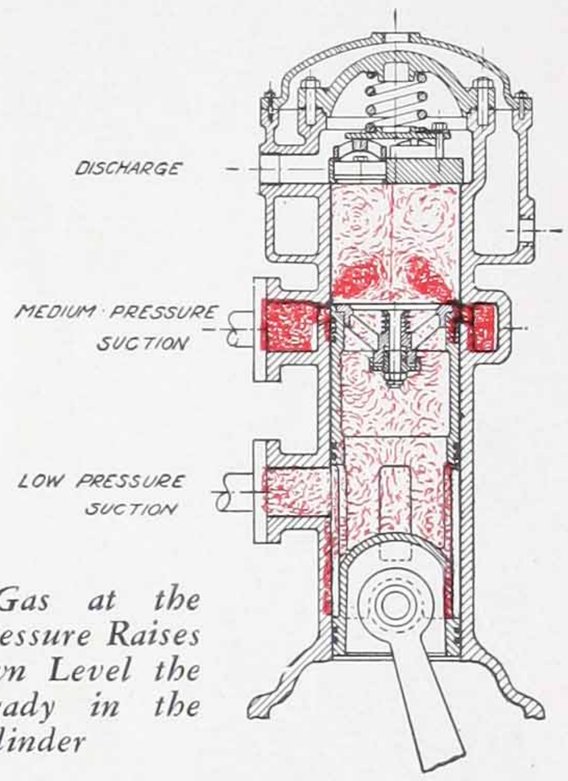
Dual-Pressure Machines

For ice-making plants and other cooling systems in which the load can be divided between two temperature levels, important economies can be made by utilizing a machine adapted to handling the suction gas at both medium and low pressures. The gas resulting from the low-pressure load is drawn into the cylinder through the piston in the same way that it enters in any refrigerating machine of the standard vertical enclosed type. Near the end of the downward stroke the piston uncovers the auxiliary ports and the medium-pressure suction gas rushes in. The piston is moving slowly at this part of the stroke, and allows an ample period of time for the higher-pressure gas to fill the cylinder, compressing the gas already there, with the result that the entire load is carried in effect at the higher suction pressure.

The capacity of the machine is considerably increased, while the horsepower expended per ton is reduced. By using the up-to-date float valve and electric controls throughout the system, a plant of this type can be operated with comparatively little attention on the part of the engineer. The inherent balancing of the pressures within the machine cylinders makes it unnecessary to maintain fine adjustments, as the respective loads vary.

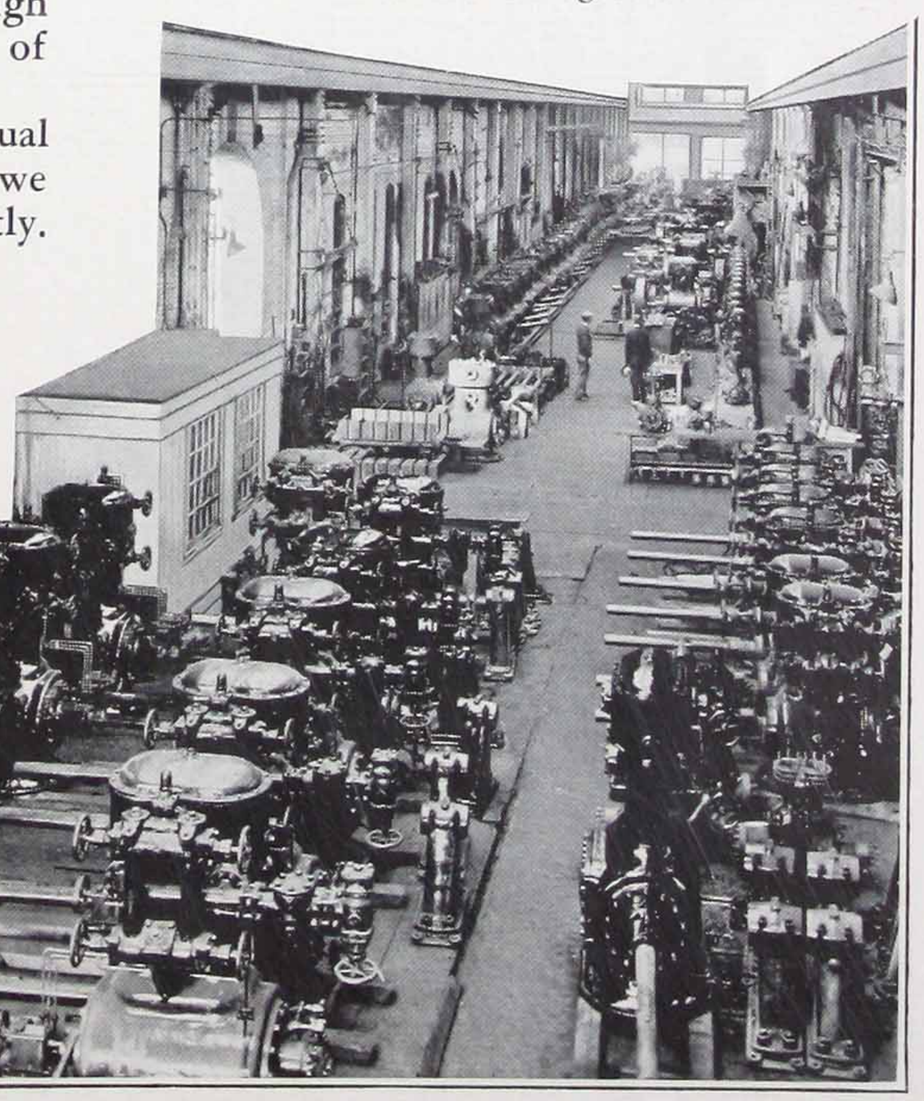
With such a system, the greater the difference in the two suction pressures, the greater the saving in power. As large a proportion of the load should be carried at the higher suction pressure level as possible. In ice-making plants, dual pressure operation recommends itself most strongly where the water to be frozen comes into the plant at a comparatively high temperature and the condensing water (which affects the temperature of the liquid ammonia) is warm.

Dual pressure machines are built with pistons and cylinders of unusual length. Having a large number of these special machines in service, we are able to supply the trade with this equipment competently and promptly.

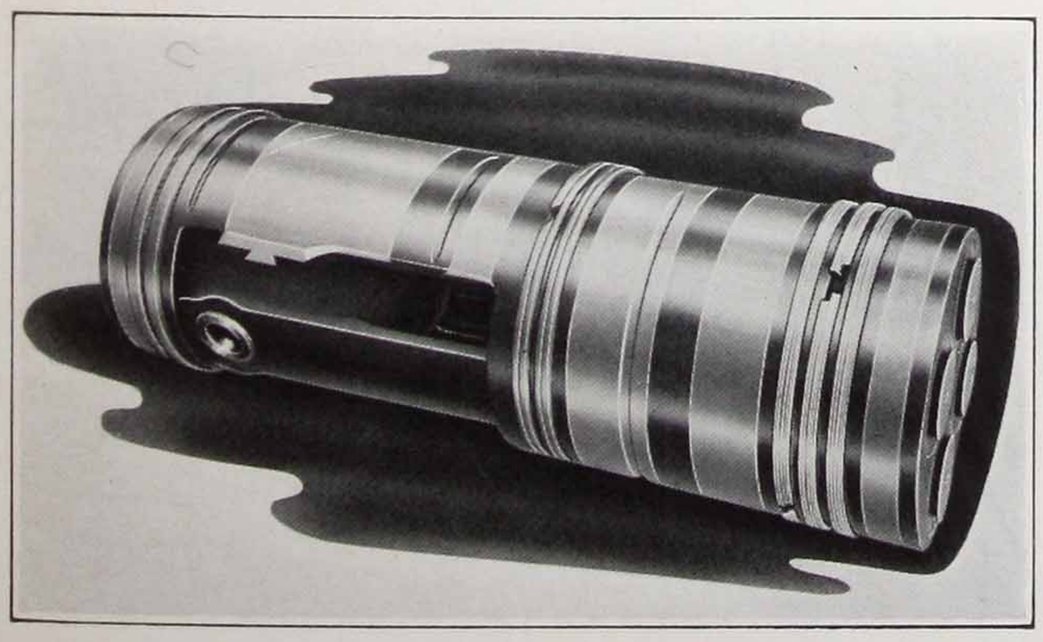


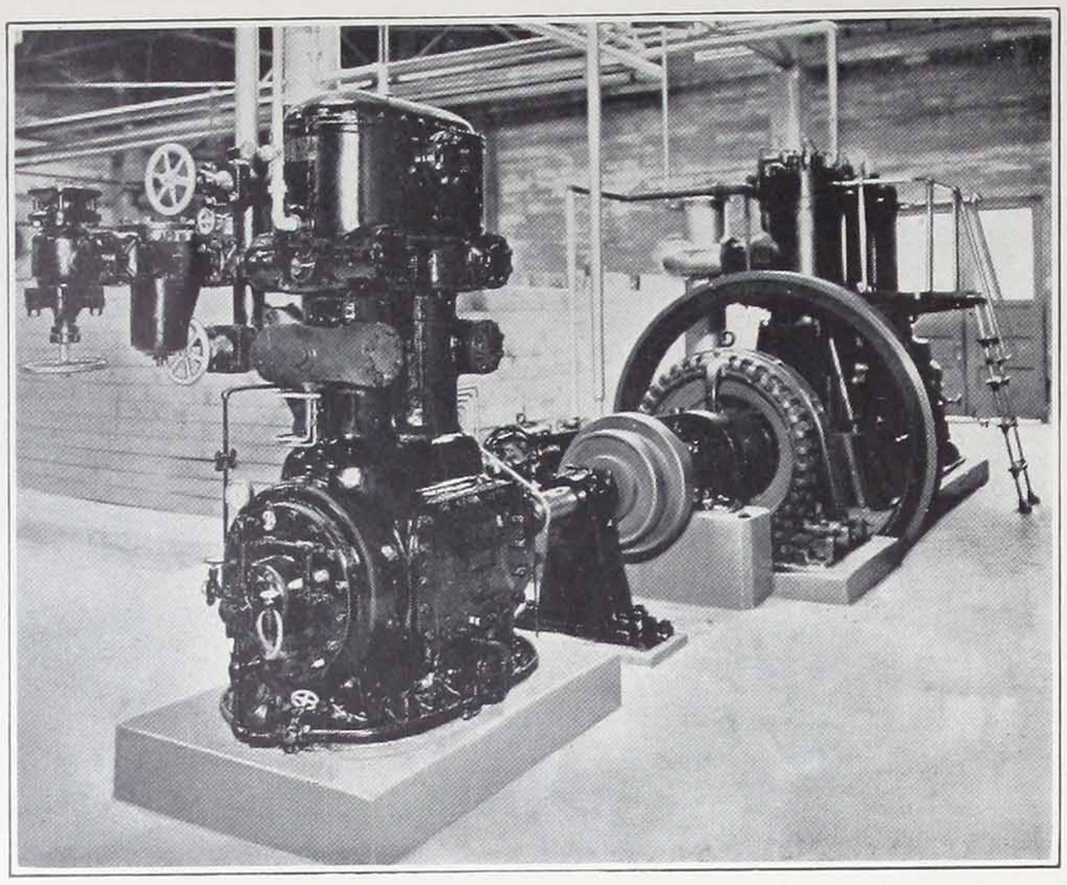
Suction Gas at the Higher Pressure Raises to its Own Level the Gas Already in the Cylinder

The Assembly Floor of the Frick Shops, Showing Dual-Pressure Machines in the Foreground

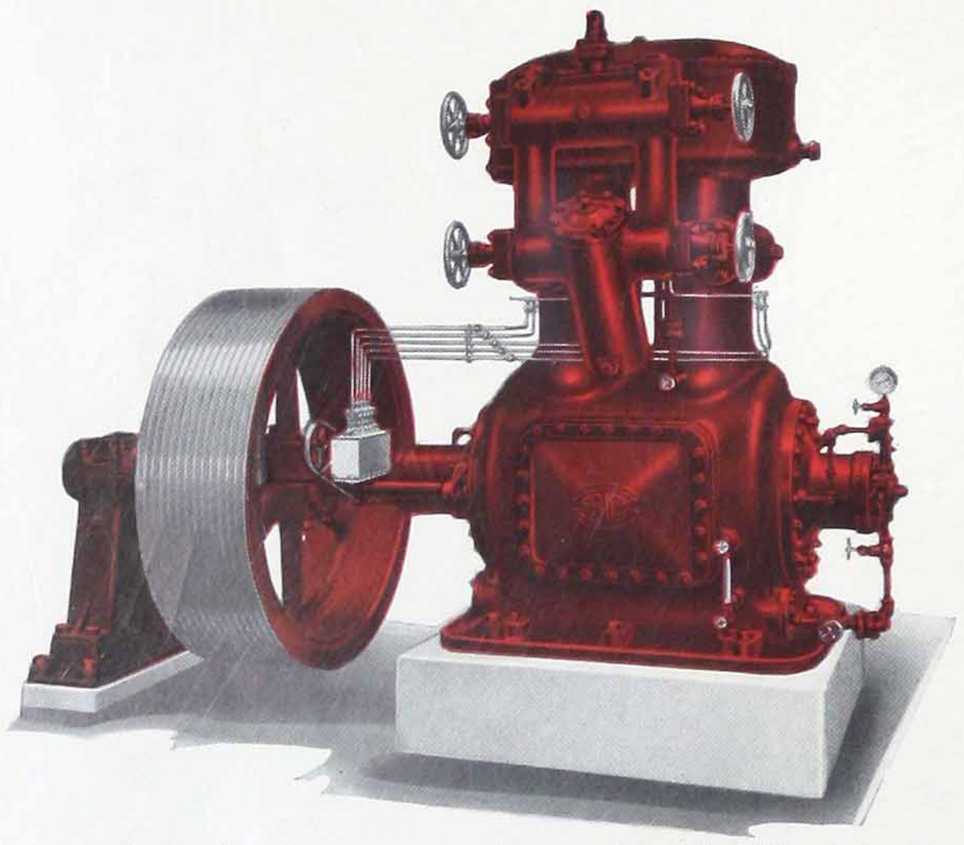


Babbitted Piston for a 10 by 10 Dual-Pressure, Machine, Showing also the Babbitt-Inserted Rings. Pistons and Rings for Standard 9 by 9 and Larger Compressors are also Similarly Surfaced



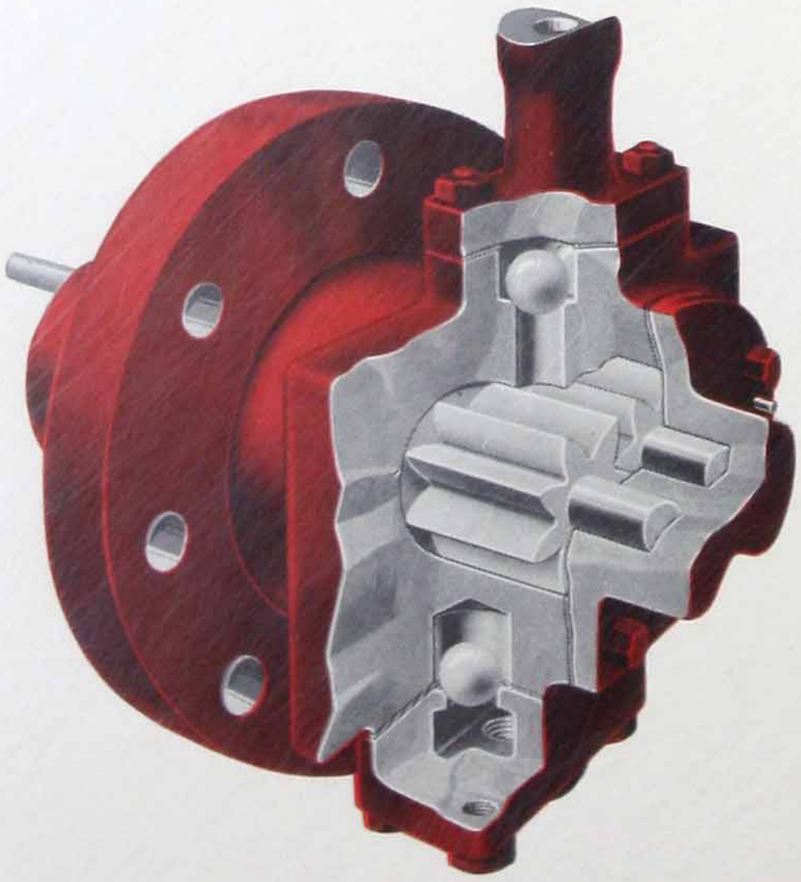


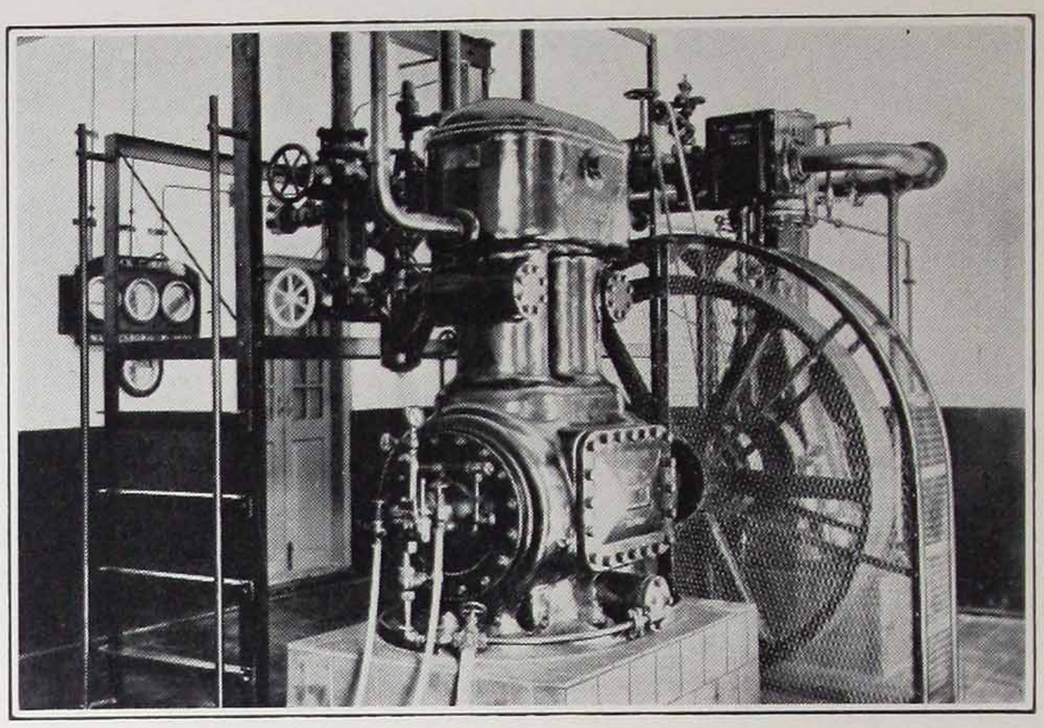
Dual-Pressure Machine Coupled to Diesel Engine, with Generator for Operating Auxiliaries: Santa Rosa, Calif.



12 by 12 Compressor Arranged with Wheel for V-Belt Drive. Note 5-Point Lubricator

Section View of Force Feed Oil Pump





Vertical Steam Engine Driving 10 by 10 Machine at the Mandalay Ice Co., in Burma

Lubrication & Drives

These Frick compressors are all equipped with a force-feed lubricating system, which keeps the main bearings, cranks and wrist pins under a constant film of oil at a pressure from 15 to 25 pounds above the suction pressure of the ammonia. The oil is drawn from the bottom of the crankcase through a screen, easily removed for cleaning.

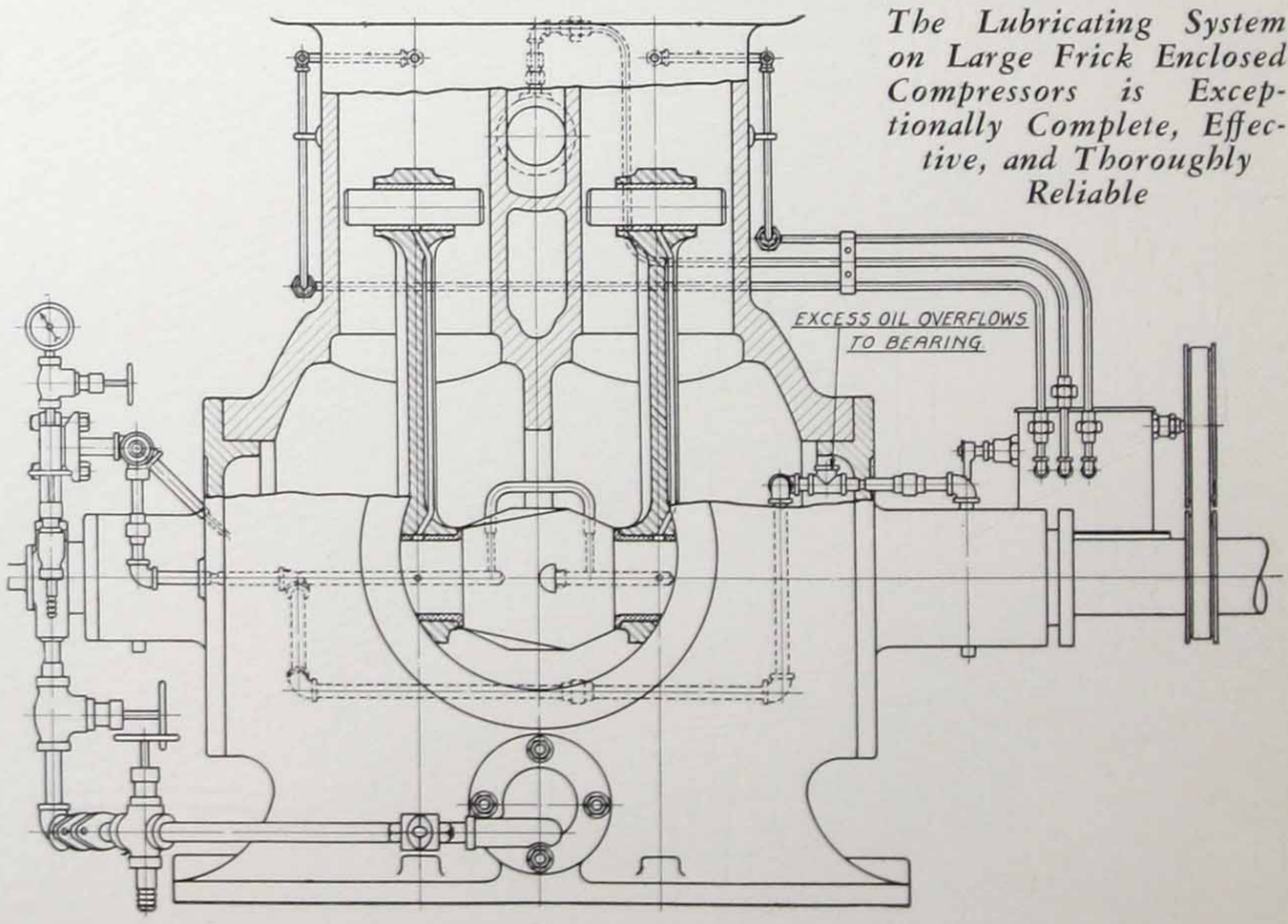
An adjustable spring relief valve allows the engineer to regulate the oil pressure carried; the excess oil passing through this relief valve is conducted to the stuffing box or Flexo-Seal and adjacent main bearing at a pressure corresponding to that of the suction pressure.

The oil is constantly recirculated, and additional oil can be charged into the machine, regardless of the direction of rotation of the shaft, without shutting down the unit. Machines in sizes 8 in. by 8 in. and larger are furnished with mechanical sight-feed lubricators to supply oil under pressure, a drop at a time, to the suction inlet and to each cylinder wall.

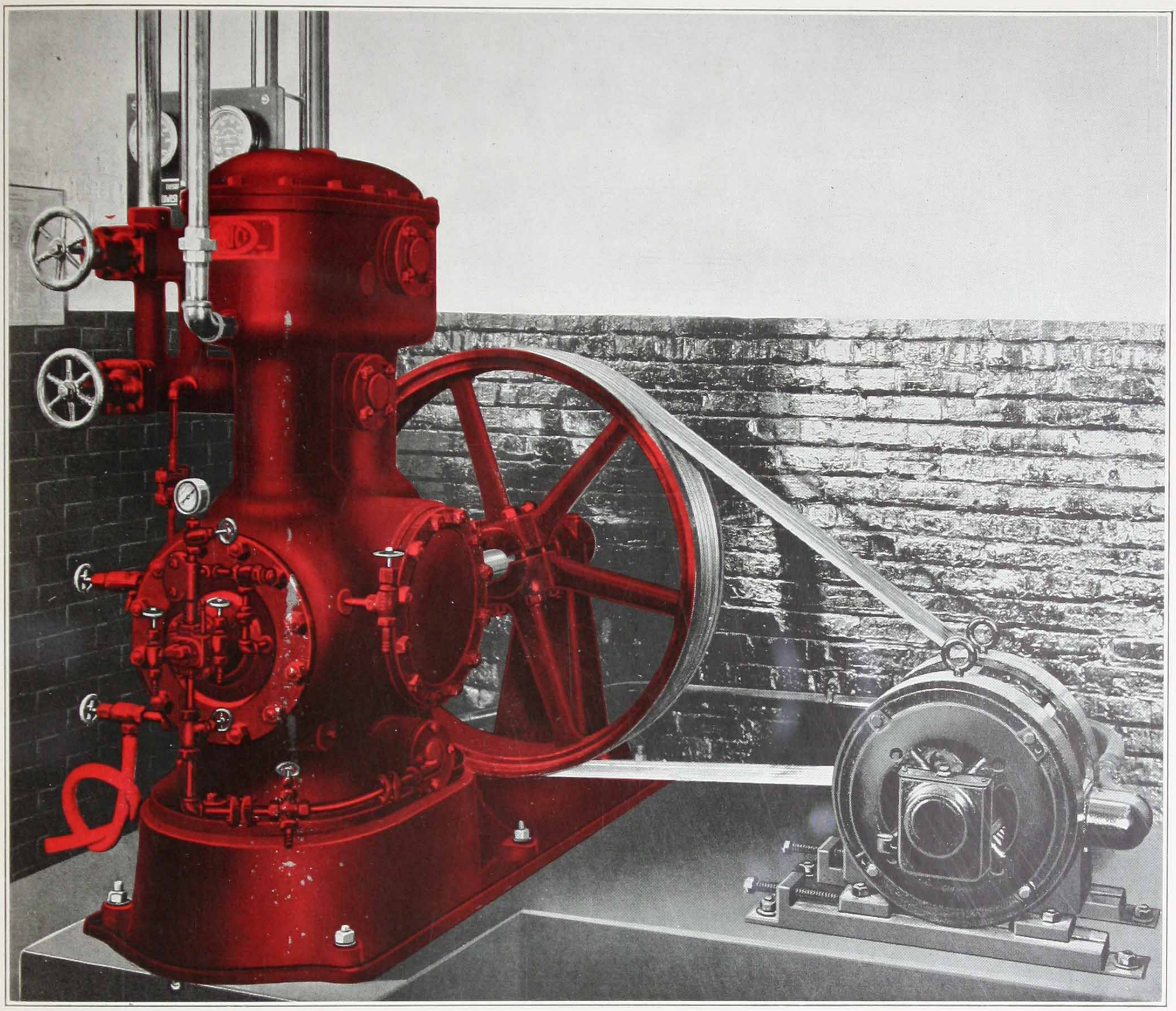
For Frick compressors of small and medium sizes, V-belt drive has been adopted as standard. Larger machines are furnished with shafts of extra length, to accommodate a direct-connected synchronous motor.

Frick short-belt drives, regular flat belts, steam or oil engine drives are of course available when wanted. Special drives, water wheels, silent chains, ropes, etc., can be furnished to suit unusual cases.

Unloading devices are also offered to suit requirements: these assist in starting machines driven by squirrel-cage or synchronous motors, by relieving the head pressure until the unit comes up to speed.

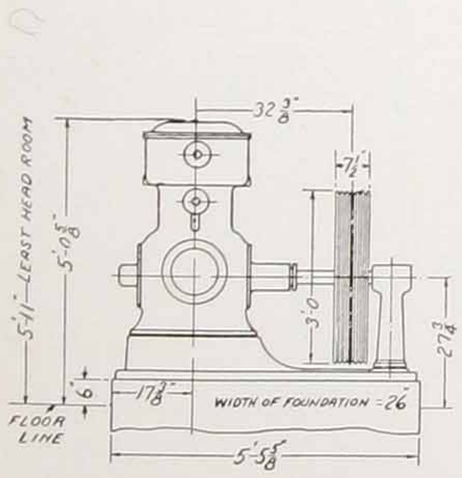


The Lubricating System on Large Frick Enclosed Compressors is Exceptionally Complete, Effective, and Thoroughly Reliable

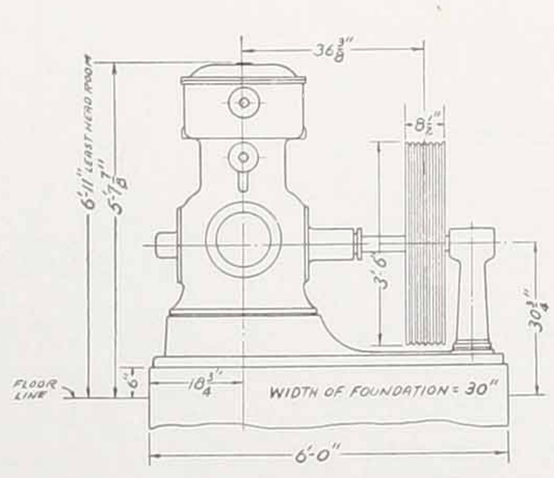


Frick Enclosed Ammonia Compressors as Furnished in 5″ by 5″, 6″ by 6″ and 7″ by 7″ Sizes

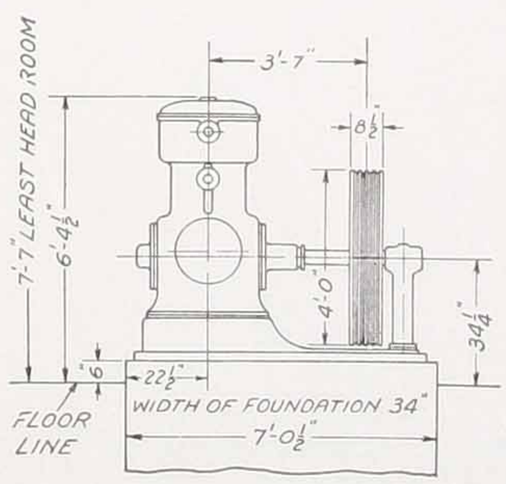
(Drawings below give Space Requirements for these Machines)



5″ by 5″ Machine with V-Belt Wheel

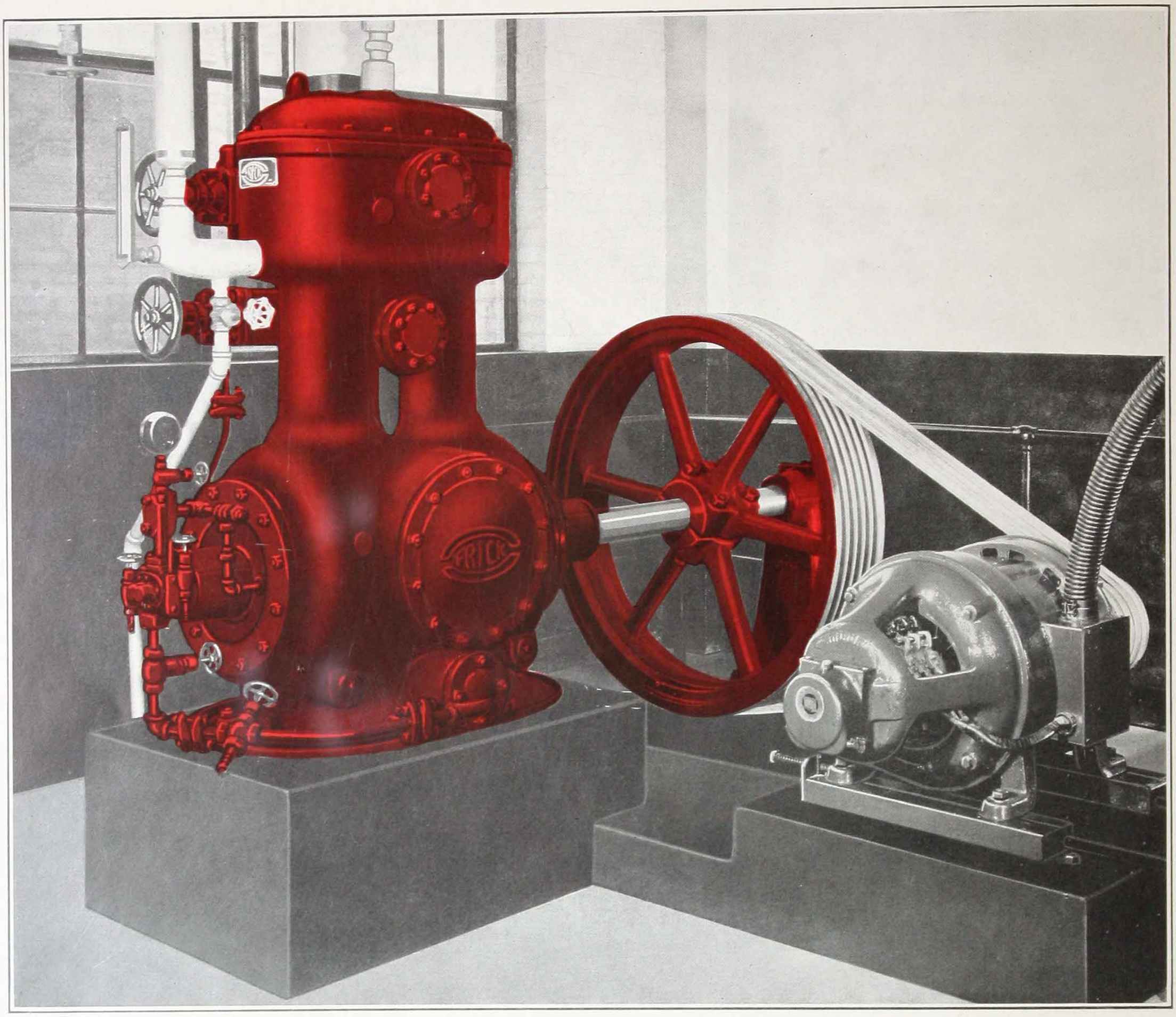


6″ by 6″ Machine with V-Belt Wheel



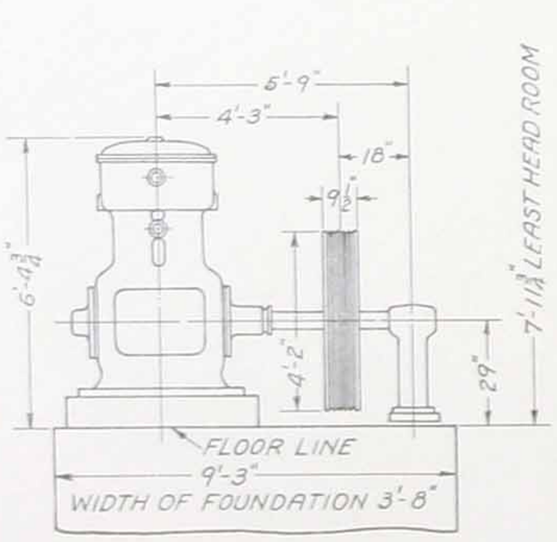
7″ by 7″ Machine with V-Belt Wheel

ICE AND FROST

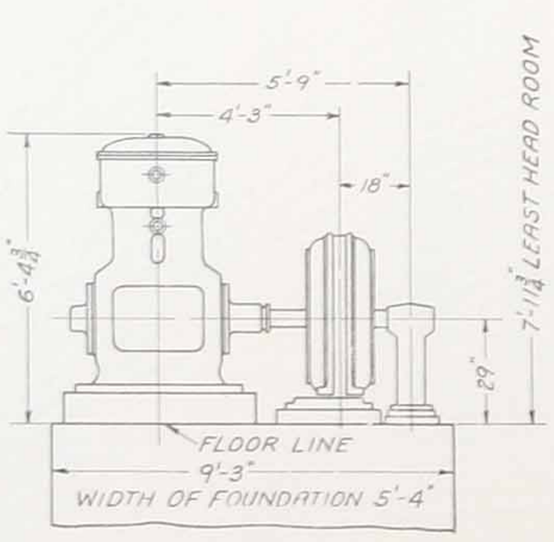


8″ by 8″ and 9″ by 9″ Machines have the Design shown in this Installation

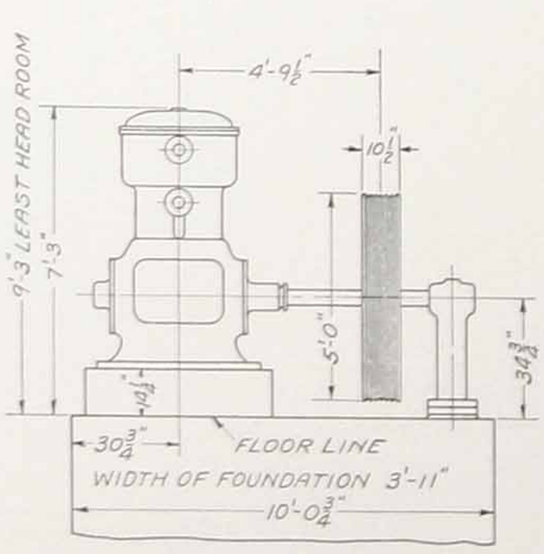
(Drawings below give Space Requirements for these Machines)



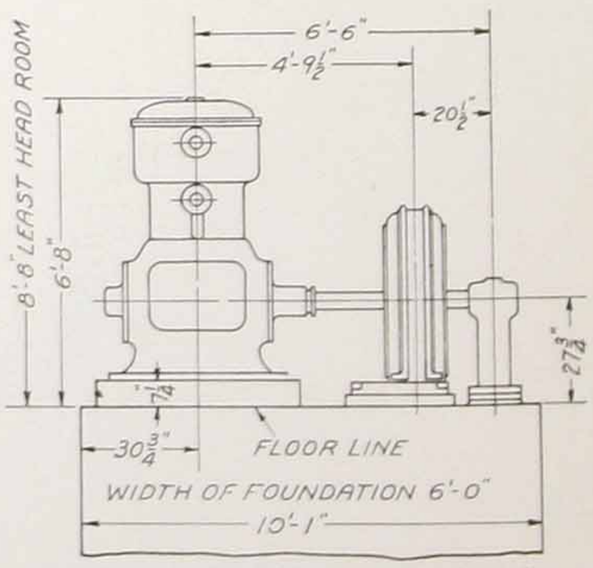
8′ by 8′ Machine wtih V-Belt Wheel



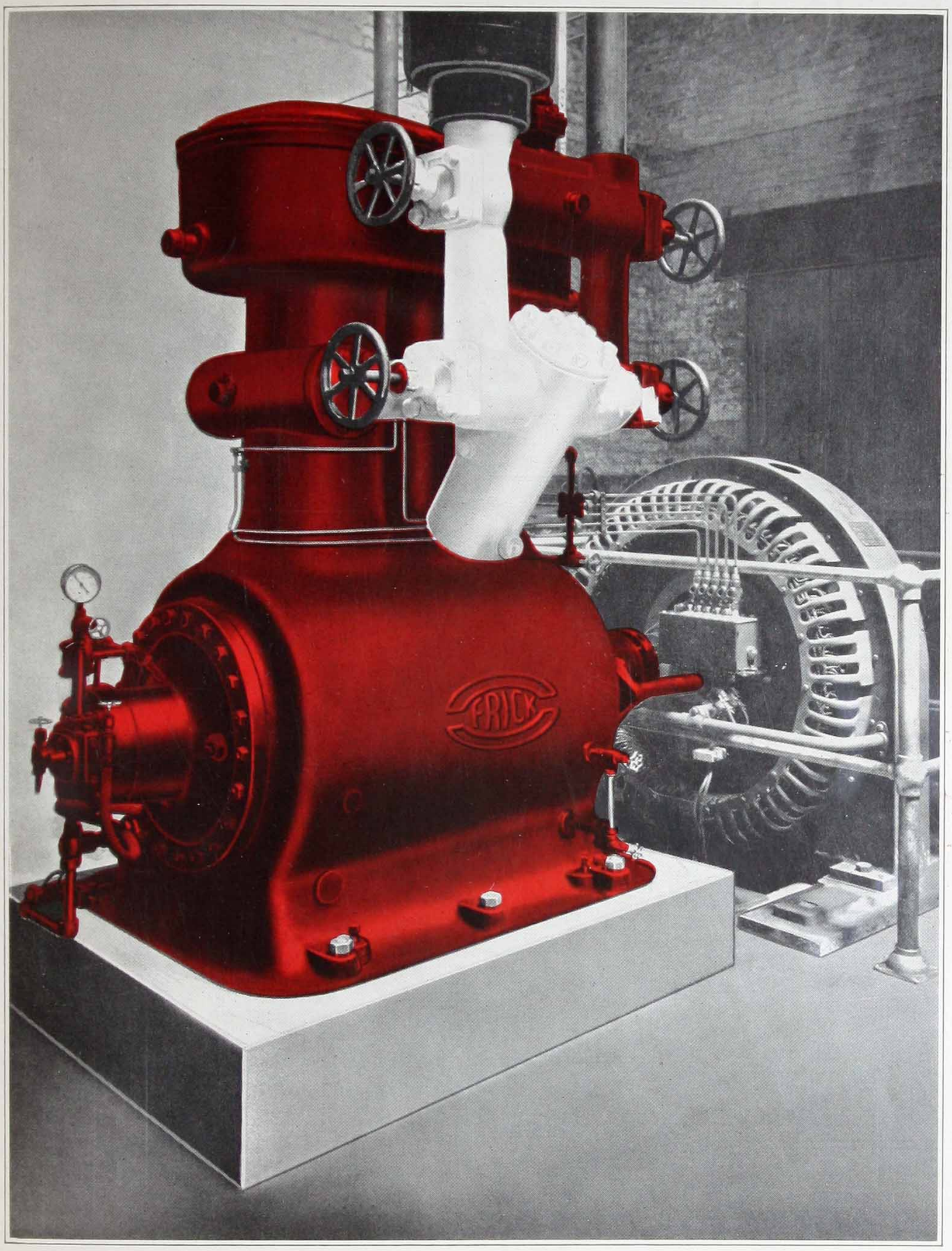
8″ by 8″ Machine with Synch. Motor



9″ by 9″ Machine with V-Belt Wheel

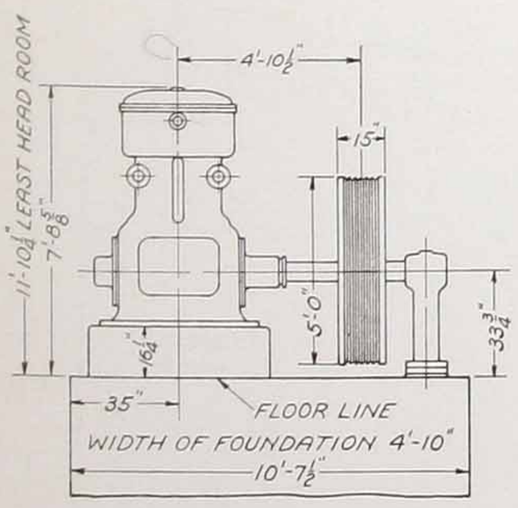


9″ by 9″ Machine with Synch. Motor

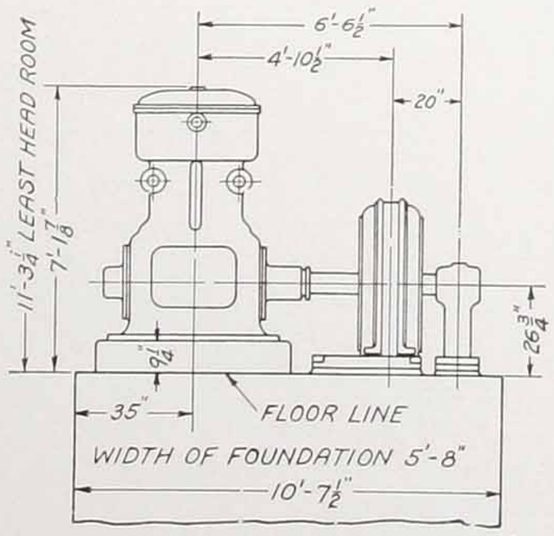


Illustrating Standard 10″ by 10″ and 12″ by 12″ Frick Compressors

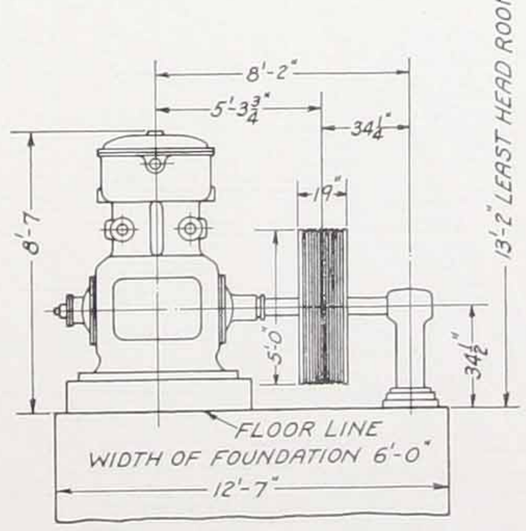
Each with Two Cylinders, Outboard Bearing is beyond Motor. Space Requirements are given below



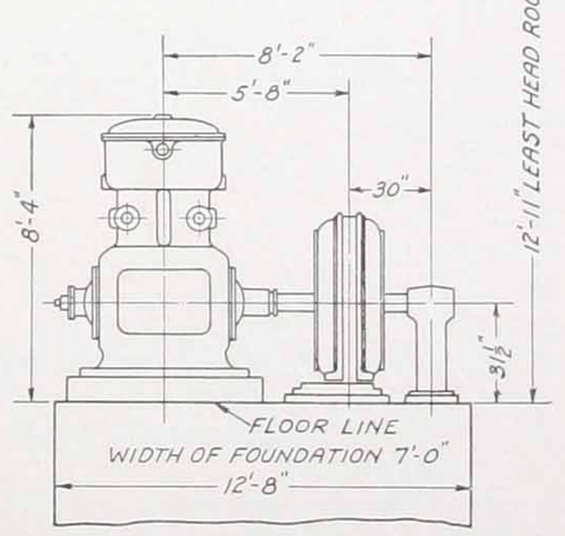
10″ by 10″ Machine with V-Belt Wheel



10″ by 10″ Machine with Synch. Motor



12″ by 12″ Two-Cylinder Machine with V-Belt Wheel

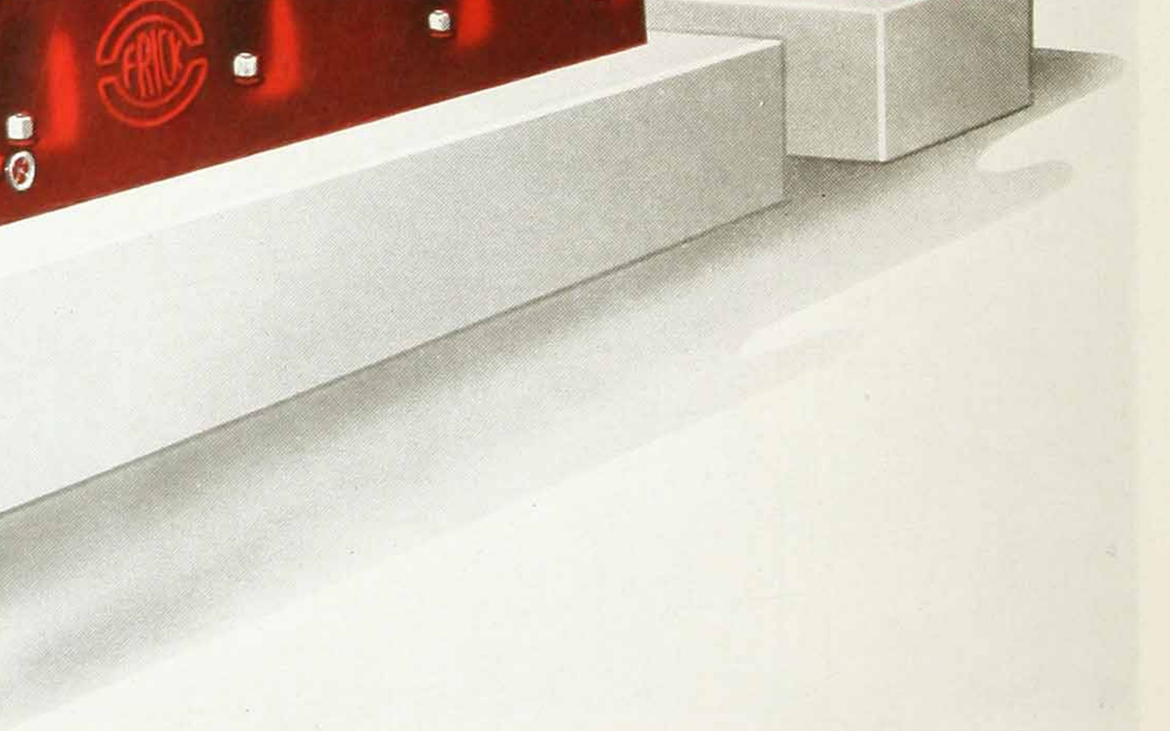


12″ by 12″ Two-Cylinder Machine with Synch. Motor

Large Frick 4-Cylinder Ammonia Compressor, with Capacity Controls. See details in Bulletin 651

OUTLINE DIMENSIONS

Dimensions	10″ x 10″ and 11″ x 10″	12″ x 12″
A —	8′- 6″	10′- 2¼″
B —	8′- 5″	9′- 5″
C —	34¼″	40″
D —	48¼″	54¾″
E —	21′-⅝″	26′-¼″
J —Length over foundation, synchronous motor drive	14′- 9″	16′- 8″
K —Width of synchronous motor foundation	6′- 6″	8′- 0″
L —Width of compressor founation	5′- 0″	5′- 4″
N —Least headroom to remove pistons	11′- 2″	12′- 6½″
Size suction connection	5″	6″
Size discharge connection	3½″	4″



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